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GUNNERS' HANDBOOK
FOR
FIELD ARTILLERY

INSTRUCTIONS FOR GUNNERS' EXAMINATION
IN THE
FIELD ARTILLERY



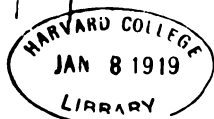
BY CAPTAINS JOHN S. HAMMOND
AND DAWSON OLMSTEAD

Inspector Instructors, Field Artillery, U. S. Army

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PREFACE

This handbook has been prepared for use in the instruction of candidates for rating as gunners under the provisions of Special Regulations No. 53, War Department, dated May 7, 1917. In this order specific requirements are laid down for the examination and classification of gunners of Field Artillery from all types of gun and howitzer batteries used in the service and for candidates from headquarters and supply companies and Battery Commanders' details.

In as much as the 3-inch gun battery is the standard type, the instruction as to matériel covered by this handbook has reference to the service of this piece. The instruction pertaining to the formation and drill of the gun squads and the firing battery will apply, however, with obvious modifications to gun and howitzer batteries other than the 3-inch.

The pages of this text covering the instruction of Battery Commanders' details and candidates from headquarters and supply companies apply to all Field Artillery organizations.

The specific requirements as laid down in Special Regulations No. 53 in each of the subjects in which candidates will be examined are printed immediately preceding the text covering the instruction in each subject. It is hoped that by this arrangement of the text the candidate may the more easily keep in mind just what is required of him to qualify as expert gunner, during the period in which he is preparing for his examination.

So much of the text of the Special Regulations as outlines the general provisions governing the examination and classification of gunners and the appointment and constitution of examining boards is included in the handbook.

Previous pamphlets of this character having been rendered obsolete by recent changes and developments in field artillery instruction, an effort has been made in the preparation of this handbook to compile, in a condensed and simple form, a text which, if closely followed, will supply the necessary data for the thorough instruction of candidates for qualifications as gunners in the Field Artillery.

Much valuable information in the preparation of this handbook has been obtained from the several government publications in relation to the subjects concerned and to a gunners' pamphlet prepared by Captain William P. Ennis, Field Artillery, U. S. Army.

Thanks are due to Captain Onorio Moretti, Field Artillery, O. R. C. and Candidate Kenneth F. Simpson for material assistance in the compilation of this pamphlet.

HAMMOND AND OLMSTEAD.

EXAMINATION AND CLASSIFICATION OF GUNNERS OF FIELD ARTILLERY

(Special Regulations No. 53, War Dept., May 7, 1917)

GENERAL PROVISIONS

	Paragraph
Place and date of examinations.....	1
Examining boards, appointment and constitution.....	2
Certificate of battery or detachment commander as to qualifications of candidates.....	3
Publication of list of successful candidates.....	4
Averages required for classification.....	5
Period of continuance of rating.....	6
Subjects of examinations, candidates from batteries....	7
Subjects of examinations, other candidates.....	8
General rules governing examining boards.....	9

1. **Place and date of examinations.**—Examinations will take place where batteries or detachments are serving and will be held so as least to interfere with field training. The dates of holding the examinations will be designated, in conformity with these regulations, by the commanders who convene the boards. Examinations for men other than recruits will not be held at intervals of less than six months. Examinations for recruits will be held at the time of each of the inspections of recruits prescribed by Drill and Service Regulations for Field Artillery. The examinations will be separate for each battery and detachment, except as provided in paragraphs 46 and 47 of these regulations.

2. **Examining boards, appointment and constitution.**—The board or boards for conducting the examinations in each Field Artillery command will be convened by the commanding

officer thereof, or, in exceptional cases, by higher commanders. Each board shall consist of three officers of Field Artillery, who shall be of the same branch, if practicable, as are the candidates to be examined; but any member of the board below the grade of field officer shall be replaced by another officer during the examination of candidates from his own organization.

3. Certificate of battery or detachment commander as to qualifications of candidates.—Each battery or detachment commander, on the day previous to the date set for the examination of candidates from his command, will submit to the senior member of the board a list of the men of his command who are to appear for examination. Each officer will certify on the list submitted by him that the candidates who have not previously qualified as gunners are, as determined by a preliminary examination conducted under his supervision, well instructed in the subjects of the examination and qualified to pass the examination required for gunners of the class for which they are recommended.

4. Publication of list of successful candidates.—The board will keep a record of marks during the examination, and at the conclusion thereof will submit directly to the commander ordering the examination a tabular list of the successful candidates from each organization, arranged in order of merit in their respective classes, with the date of qualification of each. The mark received in each subject by each candidate will appear opposite the candidate's name and the appropriate totals will be carried out. The tabular list, upon approval by the commander ordering the examination, will be published in orders as required by Army Regulations.

5. Averages required for classification.—Candidates, to be classed as expert first-class gunners, must attain an average of not less than 85 per cent. in each subject prescribed in paragraph 7 of these regulations or an average of not less than 80 per cent. in each subject prescribed in paragraph 8 of these regulations; to be classed as first-class gunners, a general average of not less than 85 per cent. with an average in each subject of not less than 75 per cent.; to be classed as second-class gunners, a general average of not less than 75 per cent., with an average in each subject of not less than 65 per cent.

6. Period of continuance of rating.—The rating of a gunner as expert first-class, first-class, or second-class will continue for the period during which he is entitled to pay as gunner as prescribed in Army Regulations.

7. Subjects of examinations, candidates from batteries.—With the exceptions mentioned in paragraph 8 of these regulations, examinations of candidates from batteries will include the following:

Subjects.	Value of subjects.	
	Gun and 3.8-inch howitzer batteries.	Howitzer batteries.
Direct laying.....	24	24
Indirect laying.....	24	42
Laying for range.....	18	..
Fuse setting.....	18	18
Drill of the gun squad.....	8	8
Matériel	8	8

8. Subjects of examinations, other candidates.—Examinations of candidates from the headquarters and supply companies and of any first-class gunner who so elects will include the following:

Subjects.	Value of subjects.
Use of the battery commander's telescope.....	10
Computation of firing data.....	16
Range finding.....	12
Reconnaissance	12
Panoramic sketching.....	8
Road sketching.....	10
Use of telephones.....	10
Visual signaling.....	12
Receiving, carrying, and delivering messages.....	10

9. General rules governing examining boards.—The following general rules will govern the boards:

(a) The conditions of examination will be made, as near as possible, the same for all of the candidates.

(b) Settings of scales will be considered correct if any of the index is coincident with any part of the line of graduation of the setting ordered.

(c) Settings ordered will always be even divisions of scale, and not fractions thereof. When a number greater than five is used, it will be a multiple of five, except in setting of the angle of site and corrector scales.

(d) The candidate may select any of the assistants authorized.

(e) The candidate is permitted to traverse the piece to middle point of traverse before each trial at direct laying.

(f) The sight, quadrant, or fuse setter, etc., will be in position in which it would be in service before the command for any trial with it is given; the scales will be set at settings different from those to be given for the trial.

(g) The trials for direct laying will be with different deflections and ranges; for indirect laying with guns and 3.8-inch howitzers, with different deflections and deflection differences; for indirect laying with howitzers, with different deflections, deflection differences, angles of site and ranges; for indirect laying for range, with different angles of site and ranges. With pieces other than the 4.7-inch gun and 6-inch howitzer, the trail will be shifted in three trials at direct laying.

(h) Changes in setting of scales required of candidates will not exceed the following: Deflection scale of peep sights, 10 mils; of panoramic sight, 200 mils; deflection difference scale, 30 mils; corrector scale, 10 mils; angle of site scale, 10 mils; range scales, 800 yards, except in the case of zone fire, in which the changes will not exceed 400 yards in zone 3, 200 yards in zone 2, 100 yards in zone 1. At direct laying the tilting scale of the panoramic sights supplied with it will be set at zero before each trial. At direct laying the deflections announced will be between 6370 and 30. At direct laying the cross

of the tangent sight will be thrown out of level by the examiners as follows: With the 4.7-inch gun and 6-inch howitzer in three trials; with other guns and howitzers for the trials requiring shifting of the trail.

(i) In time trials, time will be taken from the word at which the candidate is instructed by this order to commence his trial to the candidate's **Ready**, or to the last word of any announcement required. No credits will be allowed if the candidate performs any part of the trial after this interval, or if the time taken exceeds the maximum given in the appropriate table of those shown hereinafter.

(j) Should any trial be vitiated through the fault of an examiner, of an assistant, or of the sight or other instrument used, that trial will be void and the candidate will be given immediately another trial of the same nature.

REQUIREMENTS AND INSTRUCTIONS FOR EXAMINATION OF FIELD ARTILLERY GUNNERS

PART I

FOR CANDIDATES FROM 3-INCH GUN BATTERIES *

SUBJECTS

- 1. Direct Laying**
- 2. Indirect Laying**
- 3. Laying for Range**
- 4. Fuse Setting**
- 5. Drill of the Gun Squad**
- 6. Matériel**

*** See Preface.**

REQUIREMENTS

1. Direct Laying

Twelve trials: Six with the peep sight and six with panoramic sight.

The target will represent a shielded gun and caisson will be placed, as nearly as practicable, at a distance of 100 yards from the gun used in the trials.

The candidate being seated on the gunner's seat, and on the command of the battery commands, for example:

1. Target, that gun.

2. Deflection, 10.

3. 2400.

At the indication of the target, the candidate causes the assistant at the trail to point the piece in its general direction at the last word of the last command he sets off the deflection and the range ordered; corrects for difference of level; operates the elevating and traversing apparatus to bring the line of sight upon the target; calls Read steps clear.

No credits will be given in the following cases:

(1) If the sight is incorrectly set for deflection or range.

(2) If, when the bubble of the cross level is accurately centered, the line of sight is found not to be on any part of the target.

(3) If, in trials with the panoramic sight with tilting the head elevation scale is moved.

If the piece is found to be correctly laid within the prescribed, credit will be given as follows:

Time in seconds, exactly or less than....	16	18	20	21	22
Credits.....	2.0	1.9	1.7	1.5	1.3

2. Indirect Laying

Twelve trials: Two aiming points will be selected, one toward the front for two groups of three trials each, and the other toward the rear for two groups of three trials each. They should be of the types used in actual firing and, for the purpose of this examination, should be about 2 miles in width, well defined, of such height as readily to be brought within the field of view, and at least 1,500 yards distant. They should be clearly pointed out to the candidates.

All of the guns of the battery will be placed in the order in battery and a candidate will be assigned to each.

For each group of three trials the board will assume a situation in the conduct of fire for adjustment by battery, commencing with the first salvo, that will require commands involving a shift of the trail for the first trial, and, for all trials, such deflection and deflection difference settings and changes of settings of scales, not exceeding the limits prescribed in paragraph 9 of these regulations, as may reasonably be expected in service.

Before the beginning of each trial an assistant is required to set the quadrant at the range to be used in the trial; he is also required to center the bubble of the quadrant elevation level after each shift of the trail.

In trials with the aiming point in rear the candidate will be allowed an assistant who, from a position in front of the axle, signals to a man at the end of the trail to move it, if necessary, so as to bring the aiming point within the field of view of the sight.

The candidates being seated on the gunners' seats, an officer of the battery commands, for example:

- 1. Aiming point, the chimney on that white house.**
- 2. Deflection, 440; or, 2. Deflection, 2800.**
- 3. On (the directing) piece, Open (Close), 10.**

At the last word of the command for the deflection each candidate sets off the deflection; applies the correction for deflection difference appropriate for his piece; causes the trail

to be shifted until the sight is directed upon the aiming point; corrects for difference of level of the wheel; manipulates the panoramic sight until the field of view will include the aiming point; traverses the piece until the vertical hair is on the aiming point; calls **Ready**, and steps clear.

The trial being completed and the candidates being again seated, the officer commands, for example, in continuance of the assumed situation:

1. **Left (Right) 120.**

2. **On (the directing piece), Open (Close) 5.**

At the last word of the command for the deflection, each candidate operates the sight and, if necessary, the trail as before; traverses the piece until the vertical hair is on the aiming point; calls **Ready**, and steps clear.

The third trial is similarly conducted.

The other groups of three trials are conducted in the same manner and at similar commands.

No credits will be given in the following cases:

(1) If the sight is incorrectly set for deflection or deflection difference.

(2) If, when the bubble of the cross level is accurately centered, the vertical cross hair is found not to be on the aiming point.

(3) If, at any time during the trial, the candidate has operated the elevating device.

If the piece is found to be correctly laid within the limits prescribed, credits will be given as follows:

Time in seconds, exactly or less than....	18	20	21	22	23	24
Credits	2.0	1.9	1.7	1.5	1.4	1.3

3. Laying for Range

Six trials, using the range quadrant. The candidate being seated on the seat on the right side of the trail, an officer of the battery commands, for example:

1. Site, 280.

2. 3400.

At the last word of the last command, the candidate sets off the angle of site; sets the quadrant for range; corrects for difference of level of the wheels; turns the elevating crank so as to center the bubble of the elevation level; calls **Ready**, and steps clear.

No credits are given in the following cases:

(1) If the quadrant is incorrectly set for angle of site or range.

(2) If no part of the bubble of the cross level is between the middle two lines on the glass tube.

(3) If there be found to be an error of more than 50 yards in laying for an yrange less than 1,500 yards or of more than 25 yards for any range equal to or exceeding 1,500 yards.

If the piece is found to be correctly laid within the limits prescribed, credits will be given as follows:

Time in seconds, exactly or less than....	14	16	18	19	20	21
Credits.....	2.0	2.8	2.6	2.4	2.2	2.0

4. Fuse Setting

Twelve trials: **Six** with the bracket fuse setter, **six** with the hand fuse setter.

Drill cartridges with fuses in good order set at safety are placed as in service.

An officer of the battery commands, for example:

1. **Corrector, 24.**
2. **2700.**

At the last word of the command for the corrector, in trials with the bracket fuse setter, the candidate sets the fuse setter at the corrector, and, as the data are received at the range ordered, receives the cartridge from an assistant, inserts its head in the instrument, sets the fuse, and calls **Ready**.

At the last word of the command for the corrector, in trials with the hand fuse setter, the candidate sets the fuse setter at the corrector, and, as the data are received at the range ordered, with the aid of an assistant, sets the fuse, and calls **Ready**.

No credits are given in the following cases:

(1) If the fuse setter is incorrectly set for corrector or range.

(2) If the candidate fails to obtain a correct fuse setting within one-fifth of a second.

If the fuse setter is found to be correctly set and is properly operated, credits are given as follows:

Time in seconds, exactly or less than....	8	9	10	11	12	13
Credits	1.5	1.4	1.3	1.2	1.1	1.0

(Special Regulations, No. 53, paragraphs 10-13.)

INSTRUCTIONS

The following are instructions to be pursued in preparation for examination on the following subjects:

- (1) Direct laying.
- (2) Indirect laying.
- (3) Laying for range.
- (4) Fuse setting.

Preliminary Instructions

Assemble candidates and illustrate setting of sights quadrant, bracket fuse setter, and hand fuse setter. Show how each thumb screw is used and how slow motion screws are thrown out of gear. Show how large settings are made and under what limits it is quicker to entirely use the slow motion mechanism. Give short cuts in settings, such as: to set the panoramic sight the limb and therefore the line of sight moves in the same direction as the left thumb when turning the worm knob on the rear sight; see that each candidate understands setting the panoramic sight at such numbers as 63 and 6300 and that 6400 corresponds with O, etc. To set the rear sight: the scroll gear handle on the rear sight when not thrown out of gear is more rapidly operated by turning with the extended palm of the hand, than by using the thumb and fingers; when making large changes in range on the rear sight it is quicker to throw in gear the slow motion device at a range less than that announced because the weight of the sight makes the scroll gear handle easier to operate downward than upward.

A careful study of pages 26 to 46 will do much toward facilitating the preliminary instructions.

Practice should be given in memorizing and repeating the data. It is important that the operations in setting the instruments should be performed in the order laid down in the pages mentioned above. As the data is always given in the same order the operations should follow each other mechanically. The invariable practice of setting instruments in regular order should be insisted upon.

When indirect laying is employed, instruction should be given in sighting along the flat side of the panoramic sight in directing the shifting of the trail to bring the line of sight approximately on the target.

Number 2 should be instructed and practiced in setting off large deflections. The top shield is graduated in mils. By sighting over the shield, at a glance, number 2 finds on the terrain over the shield a point at the deflection change given. He then brings the line of sight to bear on this point by shifting the trail.

Practice accuracy in setting the instruments and laying the piece. Speed will come with practice. Remember that unless the scales are correctly set no credits can be given, no matter how quickly the piece and sights may have been laid and set. In indirect laying, if the elevating handle is touched by the gunner, remember that no credits are allowed for that trial. Be sure the aiming point is understood and that the terrain in its vicinity has been studied in order that it will be familiar to the candidate when viewed through the panoramic sight.

Before starting each subject go to a piece that is not in use and have some one give you firing data in order that you will have your hand in before your examination takes place.

Summary of results to be accompanied by foregoing training:

Thorough familiarity with the instruments to be used, their scales, method of operation and facility in operating them.

Exactitude and celerity in setting off data given on all instruments.

Ability to remember data.

Instinctive knowledge of which way to turn crank handles, knowledge of means of quickly getting aiming point in the field of view and ability to give proper directions to assistant at trail.

Knowledge and habit of the sequence of the different steps in laying the piece by each method required by the examination.

Facility of operation, using both hands simultaneously when possible.

Reduction of time consumed without sacrifice of accuracy.

Steadiness, confidence and thorough familiarity with all requirements of the examination.

SUBJECT 5.—DRILL OF THE GUN SQUAD

Requirements

The candidate will be examined by questions and by requiring him to act as instructor of a gun squad.

The subjects will embrace such parts of the following exercises as will thoroughly test the candidate's familiarity with the service of the piece: Formation of the gun squad; to form the gun squad; to tell off the gun squad; posts of the gun squad, carriages limbered; to post the gun squad; posts of the cannoneers, carriages limbered; to post the cannoneers; to mount the cannoneers on the carriages limbered; to dismount the cannoneers from the carriages; posts of the cannoneers, carriages unlimbered; preparation for action; to load and lay; to fire the piece; to change from direct to indirect laying; to shift the trail; to change target; to discontinue and resume the fire; the manner of conducting the various methods of fire, but not including the giving of commands therefor.—(Special Regulations No. 53, par. 14.)

INSTRUCTIONS

In his examination on **Drill of the Gun Squad** the candidate should stand at attention in front of his squad and explain the maneuvers directed—not necessarily in the words of the book—but clearly, so each man would know the duties he had to perform in executing the maneuvers explained. Upon completing the explanation he will have the carriages prepared and the squad posted in proper formation to begin the movement, and will then give the commands and cause the squad to execute them.

If the candidate observes mistakes during the execution of the movement he should correct them.

The following paragraphs of the **Drill and Service Regulations** completely cover the foregoing requirements. It is necessary to learn these paragraphs, which most men will have done to a greater or less extent in their drill.

Study and learn one paragraph each day. Recite it to the candidate next you and have him repeat it to you. Go back to the ones of the days before as you progress, and keep them fresh in the mind.

Composition of the Gun Squad

Each **gun squad** consists of one of the corporals and seven of the privates assigned to the service of a gun section. The corporal is the **gunner** and should be selected for his qualifications without regard to his rank in the section. The privates are **cannoneers**, numbered from No. 1 to No. 7.

Composition of the Caisson Squad

Each **caisson squad** consists of one of the corporals and seven of the privates assigned to the service of a caisson section. The corporal is a **caisson corporal**. The privates are **cannoneers**, three of whom are assigned to the first caisson and numbered from No. 4 to No. 6, and the remaining four to the second caisson and numbered from No. 4 to No. 7.

Movements prescribed for a gun squad apply, with obvious modifications, to a caisson, driver, or mechanic squad.

Composition of the Driver Squad

Each **driver squad** of the gun and caisson sections consists of a **caisson corporal**, the six drivers of the carriages of the section, and an extra **cannoneer**, No. 8, who is trained as a spare driver.

Formation of the Gun Squad

Each **gun squad** is formed in double rank as follows: The **gunner** and Nos. 2, 4, and 6 in the front rank in order from right to left; Nos. 1, 3, 5, and 7 in the rear rank, in order from right to left; No. 1 covering the **gunner**.

6	4	2	G
---	---	---	---

40 inches

7	5	3	1
---	---	---	---

Formation of the Caisson Squad

Each caisson squad is formed in double rank as follows: The caisson corporal and Nos. 4, 5, and 6 of the first caisson in the front rank in order from right to left; Nos. 4, 5, 6, and 7 of the second caisson in the rear rank, in order from right to left; No. 4 covering the caisson corporal.

6	5	4	CC
---	---	---	----

40 inches

7	6	5	4
---	---	---	---

Formation of the Driver Squad

Each driver squad is formed in double rank as follows: The caisson corporal is on the right of the front rank; the lead, swing, and wheel drivers of the piece in a gun section, or of the first caisson in a caisson section, are on the left of the caisson corporal in order from right to left; the lead, swing, and wheel drivers of the caisson in a gun section, or of the second caisson in a caisson section, are in the rear rank in order from right to left covering the drivers of the front rank; the spare driver, No. 8, is in the rear rank covering the caisson corporal.

W	S	L	CC
---	---	---	----

40 inches

W	S	L	8
---	---	---	---

The driver squad of the ninth section is similarly formed, the spare lead and spare wheel drivers taking, respectively, the places prescribed for the caisson corporal and No. 8.

To Form the Gun Squads

The instructor indicates the place of formation and commands: **FALL IN.**

Each gunner repeats the command and hastens to place himself, faced to the front, where the right of his squad is rest.

The cannoneers move at double time and take their places.

The place of formation is indicated and the command given thus, for example: 1. **In front (rear) of your pieces (caissons);** or, 1. **On the right (left) of your pieces (caissons) facing them;** or, 1. **On the road facing the par**
2. **FALL IN.**

In case the front or rear of the carriages is designated, each squad falls in at its post.

For the first formation of the gun squads for any drill exercise the instructor cautions **as gun squads** before giving the command.

To Tell Off the Squads

CALL OFF. In each gun squad the cannoneer on the right of the rear rank calls off **one**; the cannoneer on the left of the gunner, **two**; the cannoneer on the left of No. **three**; and so on. The gunner does not call off.

In each caisson squad the cannoneers of the front rank call off first, thus: **four, five, six**, in order from right to left, followed by the cannoneers of the rear rank in the same order. The caisson corporal does not call off.

After having called off, if a subsequent formation is ordered, the cannoneers fall in at once in their proper order.

Posts of the Gun Squads, Carriages Limbered

In front of the pieces or caissons: Each squad is in line facing to the front, its rear and center 2 yards from the end of the pole or from the heads of the lead horses.

In rear of the pieces or caissons: Each squad is in line facing to the front, its front and center 2 yards from the muzzle or from the rear of the caisson.

If no special place of formation is designated, each squad, when formed at the carriages, is posted in front of the leading carriage of its section.

To Post the Gun Squads

The squads are marched to the park, and, on arrival near the carriages, the instructor commands: **Squads in front (rear) of your pieces (caissons).**

Each gunner marches his squad to its carriage and posts it in the indicated position.

The instructor habitually causes the squads to approach the front (rear) of the carriages which he designates in his command, from the right of the park if left in front and from the left if right in front.

Posts of the Cannoneers, Carriages Limbered

The gunner and No. 1. opposite the rear of the limber wheels of the piece.

Nos. 2 and 3 opposite the rear of the gun wheels.

Nos. 4 and 5 opposite the rear of the caisson wheels.

Nos. 6 and 7 opposite the rear of the limber wheels of the caisson.

The gunner and even numbers are on the right, the odd numbers on the left, all 2 feet outside the wheels, facing the front.

To Post the Cannoneers

1. Cannoneers; 2. POSTS. Each gunner repeats the command **posts**. The cannoneers leave the ranks, if formed, and move at double-time by the shortest practicable routes to their posts.

For preliminary instruction the squads, on entering the park, are first posted with their carriages; the cannoneers are

then sent to their posts by the foregoing command. The command is general, however, and is applicable when the cannoneers are in or out of ranks, at a halt or marching, and when the carriages are limbered or unlimbered.

To Mount the Cannoneers on the Carriages Limbered

In each squad the gunner and No. 1 mount on the limber chest of the piece.

Nos. 2 and 3 mount on the axle seats.

Nos. 4 and 5 mount on the caisson chest.

Nos. 6 and 7 mount on the limber chest of the caisson.

When extra cannoneers are present:

No. 8 mounts between Nos. 6 and 7.

No. 9 mounts between Nos. 4 and 5.

The gunner and even numbers mount on the right side of their respective carriages, odd numbers on the left.

1. Cannoneers, prepare to mount; 2. MOUNT.

At the first command the cannoneers who mount on the limber chests or axle seats hasten to the rear of the limber chests or axle seats; those who mount on the caisson chests hasten to the front of that chest. Each cannoneer who mounts on the limber chest places the foot nearest the wheel on the step, grasps the chest handle with the hand nearest the wheel, and with the other hand grasps the hands of the cannoneer opposite him. Each cannoneer who mounts on the caisson chest places the foot nearest the wheel on the step, and grasps the chest handle with the hand nearest the wheel. Cannoneers who mount on the axle seats place the foot nearest the wheel on the brake beam, and grasp the seat handle nearest the wheel.

At the command **mount**, all spring up and seat themselves, those on the chests facing to the front, those on the axle seats to the rear. Those who mount on the limber chests place the foot farthest from the wheel on the top of the limber chest, and then step down on the footboard.

If the command be: **1. Cannoneers; 2. MOUNT**, the cannoneers execute, at the command **mount**, all that has been prescribed for the commands **prepare to mount** and **mount**.

To Dismount the Cannoneers from the Carriages

1. Cannoneers, prepare to dismount; 2. DISMOUNT.

The cannoneers on the chests stand up on the footboards at the first command; at the second command all the cannoneers jump to the ground and take their posts at the double time.

If the command be: **1. Cannoneers; 2. DISMOUNT**, they execute, at the command **dismount**, all that has been prescribed for the commands **prepare to dismount** and **dismount**.

Posts of the Cannoneers, Carriages Unlimbered but not Prepared for Action

In each squad the gunner immediately in rear of the cannoneer's seat, on the left side of the trail of the gun.

No. 1, immediately in rear of the cannoneer's seat, on the right side of the trail of the gun.

No, 2, 2 feet in rear of the gunner, covering him.

Nos. 3, 4, and 5, 2 feet in rear of the caisson chest in the order named from right to left.

Nos. 6 and 7, abreast and in order from right to left, 5 yards in rear of the trail spade.

Higher-numbered cannoneers, if present, accompany the limbers. The cannoneers stand at attention at their posts, facing to the front.

To Change the Posts at the Cannoneers

In order, to exercise the cannoneers in all duties connected with the service of the piece, to vary the drill, and to fix the attention of the men the posts of the cannoneers are frequently changed.

The cannoneers being at their posts, carriages limbered or unlimbered: **1. Change posts; 2. MARCH.**

In each squad No. 1 quickly takes the post of No. 2, No. 2 of No. 3, No. 3 of No. 4, No. 4 of No. 5, No. 5 of No. 1. Higher-numbered cannoneers change only when specially directed.

To Prepare for Action

The carriages being in position unlimbered: **PREPARE FOR ACTION.**

Each member of the gun squad performs his duties in the order given below:

- Gunner: (a) Removes the hood from the sight bracket;
(b) Releases the traversing and elevating lock and operates the traversing and elevating gear;
(c) Removes the sight shank from its case and places it in its socket, setting the range at 3,000 and the peep sight deflection at zero;
(d) Takes the panoramic sight from its case and places it in its seat, making sure that the sight is clamped and that the deflection is set at zero;
(e) Raises and secures the top shield, with the assistance of No. 1;
(f) Seats himself on his seat.

No. 1: (a) Removes the quadrant from its case and places it in its seat; centers the cross level bubble;

(b) Sets the range at 3,000 and the sight at 300, and brings the range bubble to the center;

(c) Equips himself with a lanyard and a wiping cloth;

(d) Operates the breech mechanism, examines the breech block, bore, and chamber, cleaning any parts requiring it, leaving the breech open, except when the gun is loaded;

(e) Assists the gunner in raising and securing the top shield;

(f) Seats himself on his seat.

No. 2: (a) Removes the breech cover;

(b) Turns back the trail handspike and engages it;

(c) Runs around to the right of the piece and assists No. 3 to lower the piece apron;

(d) Distributes tow or waste to the cannoneers for use in their ears;

(e) Seats himself on the handspike.

No. 3: (a) Runs around the left of the caisson and removes the muzzle cover:

(b) Removes the front sight cover and adjusts the sight in its firing position;

(c) Lowers the piece apron, with the assistance of No. 2;

(d) Seats himself at the fuse setter, with his back to the right caisson wheel;

(e) Sets his scales at corrector 30, range 3000;

No. 4: (a) Assisted by No. 5, lowers the caisson apron;

(b) Lowers the fuse setter;

(c) Assisted by No. 5, raises the caisson door;

(d) Stands ready to serve ammunition.

No. 5: (a) Assists No. 4 to lower the caisson apron;

(b) Assists No. 4 to raise the caisson door;

(c) Puts a round of shrapnel in the fuse setter, setting the fuse;

(d) Stands ready to serve ammunition.

The cannoneers report to their chief of section if any parts of the matériel are not in working order.

The carriages, limbered, are habitually prepared for action before reaching the firing position. The duties of the cannoneers are the same as at the carriages unlimbered, except that after the examination of the elevating and traversing gear the piece is secured by the traveling lock; the trail handspike is not turned back; the breech is closed; the firing pin is released; the fuse setter is not lowered, nor is a round put in the fuse setter; the apron is not lowered; the caisson door is left closed; and the cannoneers do not take their posts for serving the gun. The gunner and No. 1 return the pano-

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3. RESULT: 100%

The Jerusalem

The collection is the horizontal angle between the light and the axis of the bore. There are two extreme panoramic light and the deep light. The panoramic signal is usually used except in fire at will.

The panoramic sight is so constructed that any horiz

limb by one division. The complete circumference is, by this arrangement, divided into 6,400 equal parts, and the **least reading** is one of these parts, called a **mil**. A deflection of 1 mil corresponds to a deviation at the objective of one one-thousandth of the range. Hence a difference of 1 mil in deflection is equivalent to 1 yard in direction at 1,000 yards from the gun, to 1½ yards at 1,500 yards, and so on.

When the panoramic sight is set at zero the vertical plane through the line of sight is parallel to the axis of the bore.

To set off a deflection of the panoramic sight: The gunner turns the rotating head of the instrument until the number of hundreds of the setting is shown by the index of the limb and the number of tens and units, if any, by the index of the micrometer.

If, in setting the deflection, the rotating head of the instrument has to be moved through a small angle only, the slow-motion screw is used. But if the reading given requires a large angular movement, the slow-motion mechanism is unengaged and the rotating head is turned around to the approximate position by hand. The slow-motion mechanism is then thrown in gear and used to set off the exact setting.

The gunner is practiced in setting deflections on the panoramic sight by command. Thus, for example: **Deflection, 1640.**

The gunner brings the index of the limb between the divisions marked "16" and "17" on the limb, then turns the micrometer until its index reads 40.

The instructor verifies the setting.

The graduations on the deflection scale of the peep sight correspond to those on the panoramic sight, the unit of the scale being 1 mil. When set at 0 (6,400) the vertical plane through the line of sight is parallel to the axis of the bore. Toward the left the readings increase, the maximum reading being 45 mils; toward the right the readings decrease, the minimum reading being 6,355 mils.

To set off a deflection on the peep sight: The gunner turns the peep-sight screw head with his left hand until the index is opposite the desired graduation.

He is practiced in setting off deflections as before.

To throw the projectile to the left, increase the deflection. To throw the projectile to the right, diminish the deflection.

The captain changes the direction by commanding: **Right (Left) (So much)**. The command **Right (Left)** indicates the direction in which the captain wishes to throw the projectile.

The gunner is practiced in setting off a new deflection. Thus, the reading being 1620, **Left 20**, the gunner at once sets 1640.

The Deflection Difference

The training of the gunner in applying the deflection difference is begun when he is expert in setting off the deflection.

The Range

The range of a target is the distance in yards from the gun to the target.

The range scale on the sight shank is graduated from 100 to 6,500 yards, the least reading being 50 yards. The scale may be readily set by eye to read to 25 yards.

To set off a range on the sight shank: The gunner moves the sight shank up or down in its socket until the desired graduation is opposite the index. In setting the range he is careful to lower his head so as to look squarely at the scale and the index.

The sight shank is moved up or down by means of a scroll gear operated with the right hand. If a considerable movement of the shank is necessary this mechanism is ungeared by drawing outward the scroll-gear handle with the right hand; the shank is then raised or lowered with the left hand until the desired graduation is near the index. The scroll-gear mechanism is then thrown in gear and utilized to set the scale at the exact setting desired.

The gunner is practiced in setting the sight for range, thus: The sight shank being in its socket, the instructor commands, for example, **2700**.

The gunner sets the sight as just described and the instructor verifies the setting.

The Cross Level

To center the bubble of the cross level: The gunner, with his left hand, turns the leveling screw on the sight-shank socket until the bubble is centered.

The centering of this bubble is necessary to avoid errors in the direction of the gun due to a difference in level of the gun wheels.

The Direction

To give the direction to the piece: The gunner traverses the piece on the carriage until the vertical cross hair of his panoramic sight is on the target or the aiming point. He habitually operates the traversing gear with his left hand. When he finds that he can not traverse the piece sufficiently to bring the vertical cross hair on the aiming point or target, he commands: **Muzzle right (left)**. Immediately upon giving this command the gunner brings his piece back to the center of traverse, except that in the case of fire at moving targets the muzzle of the gun is moved as far as it will go in the direction opposed to that of the motion of the target.

The gunner is practiced in the manipulation of the traversing gear and in bringing the vertical cross hair accurately on the aiming point. He must form the habit of turning the traversing handwheel in a clockwise direction to throw the cross wires to the left, and *vice versa*. He must also form the habit of bringing the gun to the center of traverse whenever it is necessary to shift the trail.

When the gunner gives the direction only, the method of laying is **indirect**. The signal that **indirect laying** is to be used is the command: **Aiming point (So and so)**.

The gunner is practiced in his duties of laying for direction only as follows:

The gunner being seated on his trail seat at the piece unnumbered, the sights in their sockets, the bubble of the cross

level centered, and the piece at the center of its traverse, the instructor commands, for example:

1. Aiming point, the chimney on that white house.
2. Deflection, 240.
3. 2400.

1. At the command for the deflection the gunner sets it off on his panoramic sight.

2. Sets off, approximately, the range announced.

3. Looks at the cross level and centers the bubble, if necessary.

4. Looks through the sight and operates the traversing mechanism so as to bring the vertical cross hair on the aiming point.

5. Calls **ready** when he has laid the gun accurately for direction.

The gunner takes care not to touch the elevating gear in this method of laying. The approximate elevation is given by the instructor or an assistant. The chief of section causes the trail to be shifted until, when the gunner has set off the deflection, a side face of the rotating head of the sight is in line with the aiming point.

The instructor verifies the sight setting and the centering of the cross level bubble and sees whether the sight is accurately directed upon the aiming point.

If the piece has been laid for a given deflection, the instructor may command, for example: **Right (Left), 20.**

The gunner applies the correction to the old deflection and lays the piece as explained above.

The Elevation

To give the elevation to the piece, the gunner turns the elevating handle until the horizontal cross hair is on the **bottom** of the target.

The gunner is practiced in the manipulation of the elevating gear. He must form the habit of turning the handle in a clockwise direction to increase the elevation and, therefore, the range and *vice versa*.

When the gunner gives both the direction and the elevation, the method of laying is **direct**. The signal that **direct laying** is to be used is the command **Target (So and so)**.

The gunner is practiced in the duty of laying for both direction and range as follows:

The gunner, being seated on his trail seat at the piece unlimbered, the sights in their sockets, the bubble of the cross level centered, the piece at the center of its traverse, the instructor commands, for example:

1. **Target, that gun.**
2. **Deflection, 10.**
3. **2400.**

At the indication of the target an assistant gives the piece the general direction under the supervision of the chief of section.

As the commands are given the gunner—

1. Sets off the deflection ordered.
2. Sets off the range ordered.
3. Centers the cross level bubble, if necessary.
4. Looks through the sight and operates the traversing and elevating mechanism so as to bring the line of sight on the bottom of the target.
5. Calls **ready** when the gun is accurately laid.

The instructor verifies the sight settings, the centering of the bubble of the cross level, and sees whether the gun is laid accurately upon the target.

Whatever the method of laying, the gunner must always see that the gun is at the **center** of its traverse whenever it is necessary to shift the trail, except when firing at moving targets. This centering of the gun in its traverse and the

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accurate establishment of the general direction avoid frequent shifting of the trail and consequent loss of time which would otherwise result.

The Ready

The call **ready** by the gunner indicates to the chief of section that the piece is accurately laid and is ready to fire.

To Avoid Injury

Unless the gunner is careful to move his head out of the way of the sight before the gun is fired, the shock of discharge may bring the sight against his eye with sufficient force to injure it.

The Command to Fire

The gunner invariably gives or repeats the command fire in actual or simulated firing, so as to insure his piece being fired at the proper time.

To Measure a Deflection

The gun being established in direction by direct laying or otherwise, the deflection may be measured by turning the rotating head of the panoramic sight until the vertical cross hair is on the aiming point. The reading of the instrument is then the deflection sought.

The gunner is practiced in measuring the deflection as follows:

The gun being laid in direction on any target with zero deflection and the gunner seated on his trail seat, the instructor commands, for example:

1. Aiming point, that clock tower.

2. MEASURE THE DEFLECTION.

1. The gunner turns the rotating head of the panoramic sight until the vertical cross hair is on the designated aiming point.

2. He then reads and announces the deflection, thus: **Deflection, 490.**

The instructor verifies the reading and sees whether the sight is accurately directed upon the aiming point.

Duties in Detail of No. 1

The duties of No. 1 in the service of the piece are:

1. To set and release the brake.
2. To open the breech.
3. To set the site on the quadrant.
4. To set the range on the quadrant.
5. To center the cross level bubble of the quadrant.
6. To close the breech.
7. In indirect laying, to give the elevation.
8. To call set.
9. To fire the piece.
10. To measure the site.

The Brake

To set the brake, No. 1 grasps the brake-lever handle, pulls the lever down until the brake shoes come firmly against the wheels, and then swings the handle in until the lever engages in the rack.

To release the brake, No. 1 grasps the handle and pulls the lever so as to tighten the brake somewhat and so enable him to release the lever from the rack by throwing the handle to one side. Having released the lever from the rack, he pushes the handle up until the brake shoes are well away from the wheels.

No. 1 sets the brake as soon as the piece has been given the general direction. Whenever the trail has to be shifted No. 1 releases the brake and sets it again as soon as the trail has been reestablished.

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The Breech

To open the breech, No. 1 grasps the operating lever with his left hand and compresses the lever latch. He then draws the lever to the rear and right, thus swinging the block to the right. The lever should be drawn sharply so as to give the ejector sufficient force to throw the cartridge case clear of the gun.

No. 1 opens the breech as soon as the gun is in position and prepared for action and keeps it open at all times, except when the piece is loaded, until the command for march order or limbering is given, when he closes it. He is careful to see that the block remains fully away from the breech so that it will not interfere with loading.

In opening the breech after firing the piece, No. 1 half rises from his seat and, leaning to the rear, opens the breech as the piece returns into battery.

The site is the angle between a horizontal plane and the line from the gun to the target. It is measured in mils and a difference of one mil in site corresponds to a difference in level between the gun and the target of one one-thousandth of the range.

On the right side of the body of the quadrant is the level scale the divisions of which are marked, 2, 3, 4, and 5. Above the level scale at the upper end of the micrometer screw is the level micrometer scale which is divided into 100 equal parts. The site is set off on these scales. A complete turn of the micrometer changes the reading of the level scale by one division. One division on the micrometer is one mil; one division on the level scale is therefore 100 mils and its graduated divisions are called 200, 300, etc. Three hundred corresponds to targets at the level of the gun; below 300 corresponds to targets below the gun; and above 300 to those above the gun.

To set off the site, No. 1, with his right hand, turns the micrometer screw until the number of hundreds of the setting is shown by the level index and the number of tens and units is shown by the index of the micrometer. It is necessary in setting the site that No. 1, after setting the level scale, place

his head so as to look squarely down on the micrometer. He must form the habit of moving the micrometer scale in a clockwise direction to increase the site setting, in a counter-clockwise direction to diminish the setting.

No. 1 is practiced in setting sites by command.

The quadrant being in its socket, the instructor commands, for example: **Site, 315.**

No 1 turns the micrometer screw until the index of the level scale is between the graduation marked 3 and the graduation marked 4, and the index of the micrometer reads 15.

The instructor verifies the setting.

The Range

In indirect laying the range is set off on the range disk of the quadrant. The range disk is graduated from zero to 6,500 yards. The least reading on the scale is 50 yards, but the range may readily be set by eye to a least reading of 25 yards.

To set off a range, No. 1 turns the scroll gear handle with the left hand until the index is opposite the designated range. In setting a range, it is important that No. 1 place his head so that his eye will be squarely opposite the range scale.

If it is necessary to make a considerable change of reading, the slow-motion mechanism is ungeared by drawing out the handle. By pushing up or down, the scale is moved until it is near the desired setting. The tension on the handle is then released and the slow-motion mechanism is thrown into gear and used to effect an accurate setting.

No. 1 is practiced in setting ranges by command.

The quadrant being in or out of its seat the instructor commands, for example: **2550.** No. 1 manipulates the handle with his left hand until the index is brought opposite the designated reading.

The instructor verifies the setting.

The Cross Level

To center the bubble of the cross level, No. 1 turns the cross level screw with the right hand. The centering of this bubble is necessary in order to avoid errors in the elevation of the piece due to a difference in level of the gun wheels. No. 1 is careful to keep the cross bubble centered at all times.

The Breech

To close the breech, No. 1 places the middle of the palm of his open left hand against the operating lever, pushes the lever to the left, and swings the block smartly to its seat.

The Elevation

When the quadrant is set and the elevation is given by No. 1 the laying is said to be **indirect**. The signal that indirect laying is to be used is the command: **Aiming point (So-and-so)**.

The signal that direct laying is to be used and that consequently No. 1 is not to set the quadrant or give the elevation is the command: **Target (So-and-so)**. In direct laying No. 1 must be careful not to touch the elevating mechanism.

To give the elevation to the piece, No. 1 operates the elevating handle until the bubble of the elevation level is centered.

Turning the elevation handle clockwise moves the bubble to the front and increases the elevation and the range, and *vice versa*. It is important that this become second nature to No. 1.

No. 1 may be practiced in his duties of laying for elevation as follows:

No. 1 being seated on his trail seat, at the piece unlimbered, the quadrant in its seat and the cross level bubble centered, the instructor commands, for example:

1. Site, 280.
2. 3400.

1. At the command for site No. 1 sets it off with his right hand.
2. Sets the range with his left hand.
3. Centers the cross level bubble, if necessary.
4. Centers the bubble of the elevation by turning the elevating handle with his right hand.
5. Calls set when he has laid the piece accurately for elevation.

The instructor verifies the settings and the centering of the bubbles.

The Set

The call **set** by No. 1 indicates that so far as he is concerned the piece is accurately laid.

As soon as he calls **set** No. 1 grasps the firing handle with the left hand.

When the chief of section cautions with the lanyard, No. 1 attaches the lanyard to the firing mechanism and, after calling **set**, steps clear of the wheel, holding the end of the lanyard in his left hand.

To Fire the Piece

To fire the piece, No. 1 at the command of his gunner pushes the firing handle down with his left hand, so as to release the firing pin. It is important that No. 1 form the habit of using only his left hand to fire the gun. This makes it impossible for him to have any part of his body in the way of the gun during recoil.

In firing with the lanyard, No. 1 pulls on the lanyard until the firing pin is released. The lanyard is not used except when the ground is such that the trail spade is not easily seated and then is usually necessary only for the first shot.

In the exceptional cases in which the captain causes each piece to fire at his command, the executive repeats the command: **No. (So and so) Fire**, unless the captain is near enough to the guns to make his voice heard by all the gun squads. Each gunner cautions fire at the proper time.

To Measure the Site

The gun is first laid directly on the target by the gunner, who sets the sight shank at any convenient range, deflection at zero, and brings both the cross hairs on target by traversing and elevating the piece. No. 1 then sets the range disk of the quadrant at the same range as that of the sight shank and centers the bubble of the elevation level by turning the micrometer screw. The site reading is the reading of the target.

No. 1 is practiced in the duty of measuring the site as follows:

The gun being accurately laid on the target by means of the panoramic sight, the sight shank being set at any convenient range, 2700, for example, the instructor commands:

1. Measure the site.

2. 2700.

1. At the command 2700, No. 1 sets 2700 on his range.
2. Centers the cross level bubble, if necessary.
3. Centers the bubble of the elevation level by turning the micrometer screw.
4. Calls out the site reading, thus: **Site, 330.**

The instructor verifies the quadrant settings and the centering of the bubbles.

Duties in Detail of No. 2

The duties of No. 2, in the service of the piece are:

1. To shift the trail so as to give the general direction of the piece.
2. To throw the empty cartridge cases out of the way of the gun squad.

To Shift the Trail

For the assistance of No. 2, the upper edges of the main and shield shields should be graduated in mils, and each division of 50 mils should be marked. No. 2 should also be

structed as to the value in mils of the width of the trail spade and of the float.

With the origin at the middle of an upper edge the divisions on the shields should be for the average case with the 3-inch field gun 6, 12, 18.1, and 24.5 inches from the origin to indicate divisions of 50, 100, 150, and 200 mils, respectively. The middle of the top of the tire is approximately 250 mils from the center division.

A shift of the trail by the width of its mark in the ground corresponds to a change of direction of about 150 mils.

A shift of the trail by the width of the float corresponds to a change of direction of about 220 mils.

To shift the trail, No. 2 stands immediately in rear of the trail handspike, feet about 18 inches apart, and grasps the handspike with both hands.

When the target is visible and direct laying is used, No. 2 sights along the barrel and shifts the trail so as to point the gun directly at the target. Unless the target is moving it should not be necessary to shift the trail during the firing. In the case of moving targets No. 2, after once pointing the piece at the target, does not shift the trail until he gets the gunner's command: **Muzzle right (left)**. He then shifts the trail so as to bring the piece again on the target.

Whenever it is necessary to shift the trail in direct laying, No. 2 watches the gunner and does not complete the shifting of the trail until the gunner has traversed the gun to the center or to one extreme of its movement on the carriage.

No. 2 is practiced in pointing the piece directly at the target.

The piece being in position and No. 2 at the trail handspike, the instructor commands, for example:

Target, that house.

No. 2 points the piece quickly on the designated target.

The instructor verifies the pointing with the panoramic sight set at zero deflection.

When the piece is laid for direction by the use of an aiming point (**indirect laying**), No. 2 gives the original direction to the piece by shifting the trail in accordance with the commands or signals of the chief of section, or of some one representing the chief of section.

To signal to No. 2, the chief of section extends his arm toward the trail, palm of the hand turned and fingers pointing in the direction in which the trail is to be moved. To indicate that the direction is correct and that the trail is to be lowered, the chief of section commands: **Trail down**; the corresponding signal is the bringing of the extended arm sharply to the side.

No. 2 is practiced in giving the piece its initial pointing in indirect laying. In these exercises an aiming point is taken, the sight is set at an appropriate reading and the chief of section, looking along a side of the rotating head, causes the gun to be given the proper direction.

No. 2 should also be instructed as to what should be the approximate direction of the piece when the sight, set at different deflections, is directed on an aiming point.

After the initial direction has been given, No. 2, in indirect laying, shifts the trail whenever the deflection is changed by 50 mils or more and also whenever he gets the command: **Muzzle right (left)**.

No. 2 must thoroughly understand that shifting the trail to the right (left) moves the muzzle to the left (right).

No. 2 is practiced in shifting the trail at the command for a deflection change of 50 mils or more.

The piece being in position and No. 2 at the trail handspike, the sight directed on an aiming point, the instructor commands, for example:

1. **Right 100.**
2. **Trail down.**

1. At the command **Right 100**, No. 2, standing in his position for shifting the trail, locates an object, as far away as possible, which is in line with the graduation marked 100 on

the right of the top of the shield, and shifts the trail to the left so as to bring the center division on the shield in line with the object selected.

2. At the command or signal **trail down**, No. 2 lowers the trail.

The instructor makes the appropriate change in the deflection setting and verifies the accuracy of the work of No. 2.

If it be impracticable to select a definite object upon which to sight, No. 2 judges the amount by which the trail must be shifted by the width of the trail spade or float.

Empty Cartridge Cases

To keep the empty cartridge cases out of the way of the gun squad, No. 2 catches the cases as they are ejected from the gun and throws them a little to the rear of the caisson wheel farthest from the piece.

DUTIES IN DETAIL OF NO. 3

The duties of No. 3 in the service of the piece are:

1. To set the corrector.
2. To set the range on the fuse setter.
3. To set the fuse when the hand fuse setter is used.

The Bracket Fuse Setter

The fuse setter is a device for setting time fuses so that the projectiles will burst in the air at such height as may be desired. It has a range scale and a corrector scale.

The range scale is graduated in yards from 0 to 6400, its least reading being 50 yards. When a shrapnel is turned in the fuse setter, the fuse is set so that the projectile will burst, after being fired, at about the range set off on the range scale.

The corrector scale is uniformly graduated into 60 divisions. Every tenth division is numbered in figures 0, 10, 20,—60. The purpose of the device is to change the time of burning of the fuse, independently of the range scale, and thus to control

the point at which the projectile bursts. Under normal conditions a change of fuse setting by one unit of this scale produces a variation of about 1 mil in the height of burst of the projectile. The middle graduation of the scale, 30, corresponds theoretically to the normal height of burst, 3 mils.

Increasing the corrector reading shortens the time of burning of the fuse and hence raises the point of burst of the projectile; decreasing the corrector reading lengthens the time of burning of the fuse and hence lowers the point of burst of the projectile.

The corrector scale thus affords the means of correcting an observed error in height of burst and of adjusting the mean point of burst at the proper height.

To set the corrector, No. 3 turns the corrector worm knob with the right hand so as to bring the movable index opposite the corrector reading ordered. It must become habitual with No. 3 to turn the corrector knob in a clockwise direction to decrease the reading, and to turn the knob counterclockwise to increase the reading.

To set the range, No. 3 turns the range worm crank, with either hand, so as to bring the range reading opposite the fixed index of the range scale. It must become habitual with No. 3 to turn the range crank clockwise to increase the reading, and to turn the crank counterclockwise to decrease the reading.

In setting either scale, No. 3 must be trained to place his head so that he looks squarely at the scale and its index.

No. 3 is repeatedly practiced in setting the scales of the fuse setter by command.

The caisson being in position with the fuse setter lowered and No. 3 being seated at the fuse setter with his back to the inside of the right wheel of the caisson, the instructor commands, for example:

1. Corrector 28.
2. 3600.

1. No. 3 sets off the corrector as soon as it is announced.
2. Sets the range scale at the range ordered.

The instructor verifies the settings.

The corrector having once been set, changes in the setting are usually made at the command: **Up (Down) (So many)**.

The command **up** means that the corrector reading is to be increased; **down** means that the corrector reading is to be diminished.

No. 3 is practiced in this method as follows:

The corrector having been set at 28, the instructor commands, for example:

1. Up 5.
2. 3400.

1. No. 3 increases the corrector reading by 5 points and, accordingly, sets corrector 33.

2. Sets the range at 3400.

The instructor verifies the settings.

Even though time fire is not being used, No. 3 always keeps his scales set according to the commands. If percussion fire is being used, No. 3 is thus always ready to pass to time fire.

The Hand Fuse Setter

The hand fuse setter is used only when the bracket fuse setter is not available. No. 3 sets the scales in a manner similar to that described for the bracket fuse setter. He also sets the fuse, No. 5 holding the round.

To set the fuse with the hand fuse setter, No. 3 engages the fuse setter on the fuse and turns the fuse setter to the right with a steady and uniform motion until the lug on the fuse comes firmly against the fuse-setter stop.

DUTIES IN DETAIL OF NO. 4

The duties of No. 4 in the service of the piece are:

1. In time fire to complete the setting of the fuse.
2. To insert the round in the breech.
3. In volley fire to call out the number of the round.

To Complete the Fuse Setting

The signal that time fire is to be used is the comma **Corrector (So much)**. The signal that percussion fire to be used is the command: **Shell, or Percussion**.

In time fire, to insure correct setting of the fuse, No. 4 turns the projectile to the right before removing it from fuse setter, being careful not to turn it until the scales have been set.

In turning the projectile, No. 4 stands slightly to the left and rear of the fuse setter facing to the right front. His left hand, back down, grasps the round at or near the forward end of the cartridge case. The palm of the right hand is placed on the base of the cartridge case; the fingers grasping the edge of the base. While turning the projectile, No. 4 takes care to hold the body of the projectile down on the guide and to keep the fuse well engaged by a steady pressure on the base of the cartridge case with the right hand. The projectile should be turned with a steady and uniform motion until the lug on the fuse comes firmly against the fuse setter stop.

To Insert the Round

In time fire: Having accurately set the fuse, No. 4 withdraws the round from the fuse setter, talking care to draw it straight out so as to avoid any possibility of changing the setting. At the same time No. 4 slips his left hand toward the point of the projectile until it is about at the center of gravity of the round. As soon as the fuse is clear of the base of the fuse setter, No. 4 springs toward the breech, stepping off with the right foot. As he approaches the gun he raises the point of the projectile slightly above the base and allows the weight of the round to be supported by the left hand.

The fingers of the right hand are rigidly extended, the palm of the hand being kept firmly pressed against the base of the cartridge case. Taking position to the left and rear of the breech, the front of his body being parallel to the axis of the bore, eyes on the breech recess, No. 4 inserts the nose of the projectile in the chamber and shoves it forward, the extended right hand being brought sharply against the face of the breech. The closing of the breech insures the proper seating of the projectile. As soon as he has inserted the round, No. 4 quickly resumes his position at the fuse setter.

When the hand fuse setter is used, and in percussion fire, No. 4 receives a round of ammunition directly from No. 5 and inserts it as above prescribed.

In percussion fire No. 4 after taking a round from No. 5, stands at his position at the breech and loads the piece **as soon as the previous round has been fired.** No. 4 is thus always ready to load the piece without loss of time. He takes care to stand clear of the breech during recoil.

No. 4 is practiced in setting the fuse and in loading the piece. His training in his duties in volley fire is not begun until drill in the duties of the gun squad combined is commenced.

DUTIES IN DETAIL OF NO. 5

The duties of No. 5 in the service of the piece are:

1. To take ammunition from the chest.
2. When the bracket fuse setter is being used, to insert the round in the fuse setter and to set the fuse.
3. When the hand fuse setter is used, to hold the round while No. 3 sets the fuse.
4. To pass the round directly to No. 4 in percussion fire, and when the hand fuse setter is used in time fire.

To Remove a Round from the Chest

To take a round from the chest, No. 5 places himself to the left rear of the round selected, grasps the edge of the cartridge case with the fingers of the right hand, pulls the round to the rear, across the front of his body, and catches the body

of the projectile with the left hand. As soon as he is relieved of one round No. 5 immediately takes another from the chest.

The Bracket Fuse Setter

When the bracket fuse setter is used, No. 5 strips off the waterproof hood of the fuse. He then inserts the point of the projectile in the fuse setter, taking care that the lug nearest the point of the fuse engages in the groove in the fuse setter and sets the fuse for the settings then on the fuse setter as prescribed for No. 4.

Having set the fuse, No. 5 immediately takes another round from the chest, strips off the waterproof hood, and stands ready to insert the round in the fuse setter as soon as No. 4 has withdrawn the previous round.

The Hand Fuse Setter

When the hand fuse setter is used, No. 5 holds the round while No. 3 sets the fuse. Nos. 3 and 5 should occupy the same relative positions that they have in using the bracket fuse setter. As soon as No. 5 has withdrawn the round from the chest and stripped off the hood, he faces to the right rear and kneels on the right knee. The round is placed with the base of the cartridge case against the right knee, the edge resting on the ground. The point of the projectile is up so that the axis of the round is pointed in the direction of No. 3's head. No. 5 grasps the round with both hands, the right arm resting on the right thigh, back of the right hand up. The left arm rests against the outside of the left leg, back of the left hand down.

To Pass a Round to No. 4

When he passes a round to No. 4, No. 5 places the right hand under the center of the cartridge case and the left hand under the center of the projectile, backs of both hands down. The round is held horizontally and well away from the body, the base of the cartridge case being presented to No. 4. No. 4 receives the round by passing his left arm under the right arm of No. 5, grasping the round between the hands of No. 5, at the same time grasping the base of the cartridge case with the right hand.

DUTIES OF NOS. 6 AND 7

Nos. 6 and 7 have no specific duties in the service of the piece after it is established in position. They act as spare cannoneers.

Upon going into action, Nos. 6 and 7 are utilized for the construction of concealment for the carriages, for line guards on the telephone lines, for the resupply of ammunition, etc. This work is done under the immediate supervision of the executive or his assistant.

COMBINED TRAINING AT THE PIECE AND AT THE CAISSON

The duties of the gunner and Nos. 1 and 2 are mutually dependent. So also are those of Nos. 3, 4, and 5. Hence, it is advisable, at an early stage of instruction, to train each of these combinations separately. The same practice may be used to advantage from time to time after the drill of the gun squads in the firing battery has been taken up.

After the cannoneers are thoroughly instructed they are permanently assigned to those positions in which they have shown themselves most capable.

METHODS OF FIRE

The methods of fire are **fire by salvo, volley fire, volley-fire sweeping, and fire at will**. The use of salvos and volleys is habitual and both natures of fire are ordinarily used in firing at each target, particularly in time fire. Volley-fire sweeping is employed during fire for effect. Fire at will is exceptional, being used only for the close defense of the guns.

Salvos

The command for a battery salvo is: **Battery right (left)**. Upon the command **fire** by the executive the pieces are fired, at the command of the gunners, in order from the right at intervals of about two seconds.

The command for a platoon salvo is: **Right right (left), or, Left left (right)**.

The first word of the command designates the platoon which is to fire.

If the command be **right right (left)** the first and second pieces only are loaded. Similarly, if the command be **left left (right)** the third and fourth pieces only are loaded.

The second word of the command indicates the flank upon which the pieces designated are to be successively fired. Upon the command **fire**, by the executive, the pieces designated are fired, at the command of their gunners, in the order indicated at an interval of about two seconds.

The interval of two seconds may be increased by cautioning, after the command for the salvo, **At (so many) seconds**. The interval thus prescribed will be used as long as salvos are fired until another interval is announced.

Occasionally it may be desirable to fire each piece at the specific command of the captain. The captain cautions: **At my command**. Each piece is then fired upon the command by the captain: **No. (So-and-so) Fire**, each gunner repeating the command **fire** when his piece is designated.

In certain cases it may be desirable to fire a single piece. The captain commands: **(Such) piece only**. The designated piece only is loaded and it is fired upon the command **fire** by the executive.

When the method of fire is by platoon salvo or by piece, the gun squads of the pieces which are not to take part in the firing keep all the instruments set and the pieces laid in accordance with the commands. All the guns are thus able to open fire immediately. To change from platoon salvos, or fire by single piece, to battery salvos, the command is: **Battery right (left)**. All the pieces take up the fire in succession from the flank indicated.

Salvos are particularly suitable for fire for adjustment on account of the facility with which the bursts may be observed.

Volley Fire

The command for battery volleys is: **Battery (So many) rounds**. Upon the command **fire** by the executive, each piece fires the designated number of rounds as rapidly as possible

consistent with accuracy and without regard to the other pieces.. To make certain that the correct number of rounds is fired, each No. 4 as he loads the piece calls out the range and the number of the round. As the last round ordered is loaded, he adds: **Last round.** Thus, the command being **Battery 2 rounds, 3200.** On loading the first round, each No. 4 calls **3200, One;** on loading the second round, each No. 4 calls **3200, Two; Last round.**

In exceptional cases it may be desirable to use one platoon only in volley fire. In such cases the command is: **Right (Left), (So many) rounds.** Only the pieces in the designated platoon are loaded and fired.

Volley fire is particularly suitable for fire for effect on account of the rapidity with which it may be delivered.

Volley-fire Sweeping

The purpose of sweeping is to distribute the fire over a wide front. It consists in changing the direction of each piece between shots.

This may be accomplished mechanically by a full turn of the traversing handwheel between rounds if there is not material lost motion in the mechanism. Or, if the reticule of the panoramic sight is provided with a horizontal scale, the line of sight may be shifted through an appropriate angle.

The commands for sweeping are: **Battery (So many) rounds, sweeping, or, Right (Left), (So many) rounds, sweeping.** The execution is the same as that of volley fire in every respect, except that after the first and each succeeding round of the sweep the gunner traverses the piece to the left by one full turn of the traversing handwheel, disregarding accurate laying in direction; or, if the reticule of the sight has a horizontal scale, instead of turning the handwheel he shifts the line of sight 10 mils to the left for ranges up to 2,500 yards, 5 mils for ranges exceeding 2,500 yards.

As soon as the last round of the sweep has been fired, the gunner traverses the piece back to the right until the line of

sight is again on the right of his portion of the target or on the aiming point.

Fire at Will

For the very close defense of the guns the command is: 1. **Target (So-and-so)**, 2. **FIRE AT WILL**. At this command sights are set at deflection zero and range 1000. Fuse setters are set at corrector 30 and range zero. Shrapnel only are used. Each gun is loaded and laid on the target. Upon the command fire by the executive, each gun is fired as rapidly as possible until the command **cease firing** or until the target disappears or actually reaches the gun. In fire at will the gunner neglects all refinements of laying, rapidity in this case being of more importance than great accuracy.

To Discontinue and Resume Fire

To suspend fire at any time, the Captain commands: **Cease Firing**. Firing is stopped and all the pieces are unloaded. The breech blocks are opened, but the pieces kept laid with the last data received.

The signal for **Cease Firing** is a prolonged blast on the whistle with the right arm raised vertically until the signal is obeyed.

To resume fire the range is announced and the command: **Fire** is given. After the first salvo or volley, the announcement of the range is the signal for load and for the executive to give the command **Fire** at the proper time.

To Change from Direct to Indirect Laying

If on account of lack of visibility of the target or other causes it becomes desirable to pass from direct to indirect laying, the instructor commands, for example:

1. Aiming point, that lone tree.

2. **MEASURE THE DEFLECTION AND THE SITE.**

The gunner measures and announces the deflection as prescribed on page 34.

No. 1 measures and announces the site as prescribed on page 40, using the range at which the range scale of the sight is set.

The instructor then gives the necessary commands for indirect laying.

To Change Target

To fire at a new target by direct laying, the captain commands: **CHANGE TARGET**. He at once points out the new target.

To fire at a new target by indirect laying, he announces the new deflection or the correction of the old deflection.

For example:

Direct laying.—“Change target, that battery.”

Indirect laying.—“Deflection 2500. On second piece open 15, etc.,” or

“Change target. Left 120, on second piece open 15, etc.”

If the change of direction is such as to require it the gunner commands: **Muzzle Right (Left)**. For indirect laying, when the captain commands **Left 120**, the gunner of the second piece announces the last deflection of his piece thus: **Deflection 2380**. The executive announces this reading as the deflection for all pieces. At the command **Left 120**, repeated by the executive, all gunners add 120 to 2380. The gunner then corrects the deflection by the deflection difference, if same is given.

If the change of direction is such as to make it necessary, and time permits, the caisson is then moved by Nos. 2, 3, 4, and 5 to its position by the side of the gun.

The executive announces the remaining firing data, and the piece is loaded, laid and fired as previously prescribed.

Subject 6.—MATÉRIEL

REQUIREMENTS

Matériel.—The examination of each candidate will be sufficiently extended to test his familiarity with the use and care of the matériel of his organization, and will be both theoretical and practical. The theoretical examination will be conducted by questions on the following subjects: Nomenclature of harness and of the parts and accessories of the wheeled matériel; use of oils; method of cleaning and lubricating parts and mechanisms; method of clearing cylinder oil and of emptying and filling cylinders; use of tools; the kinds of projectiles, of fuses, and of powder actually issued for use, and their general purpose and effect, omitting questions as to construction, weight, manufacture, and technical description; the care and preservation of saddle and harness equipment in use; preparation of blank ammunition; precautions to be observed in firing blank ammunition; care and cleaning of cartridge cases.

The practical examination will be conducted by requiring each candidate to adjust to an animal one or more parts of the harness; to perform or to direct the performance of one or more of the following operations: Breech mechanism, to dismount, to assemble; elevating screws, to dismount, to assemble; hub liner, to remove, to assemble; brakes, piece and caisson, to adjust; wheel, to remove, to replace.

The candidate will be given credits in each of the two parts of this subject based on half the total value allotted, but only the sum of the credits will appear in its report.

(Special Regulations No. 53, par. 15.)

Instructions

The following pages contain instructions as to the use, care and adjustment of all parts of the 3-inch gun matériel,* including the use of tools, sufficient to satisfy all the foregoing requirements.

*See Preface.

NOMENCLATURE OF THE MOST IMPORTANT PARTS OF THE GUN, CARRIAGE LIMBER AND CAISSON

The following names of parts should be learned in connection with their location, by going over the pieces and carriages *vis*:

Nomenclature of parts of gun:

Jacket.
Locking hoop.
Tube.
Bore.
Rifling.
Lands.
Grooves.
Breech recess.
Front clip.
Guide rail clips.
Recoil lug.
Line sight (front and rear).

Breech Mechanism for 1902 model gun:

Name of Part.	Location
Breech block	
Block cover	Rear of block.
Block carrier	Hinged to jacket (supports block).
Breech block stop.....	In front face of carrier.
Cover locking pins.....	Secure cover to block.
Hinge pin	Hinges carrier to jacket.
Hinge-pin catch	In hinge pin.

Name of Part	Location
Firing pin	In hole through block.
Firing-pin spring	Around pin.
Cap	On rear end of firing pin.
Cocking lever	In seat in block.
Sear	In seat in block.
Sear spring	In recess in block.
Trigger	In seat in block carrier.
Trigger spring	In seat in block carrier.
Trigger arm	On trigger-arm sleeve.
Trigger-arm sleeve	In bearing on recoil lug.
Operating lever	Pivoted on block carrier.
Operating-lever pivot	Pivots lever on block carrier.
Lever-pivot key	Secures pivot in seat.
Lever latch	In operating lever.
Lever-latch catch	Screwed into rear face of carrier.
Lever latch pin	Secures latch to lever.
Lever-latch spring	In recess in lever.
Extractor	In breech recess.
Extractor lever	Mounted on hinge pin.

Nomenclature of Important Parts of Breech and Firing Mechanism, Model 1905

Name of Part	Location
Breech block	On block carrier.
Vent bushing	Front end of block.
Block carrier	Hinged to jacket; supports block.
Block stop	Screwed into front face of carrier.
Hinge pin	Hinges carrier to jacket.
Hinge pin catch	In hinge pin.
Extractor	In breech recess.

Name of Part

Location

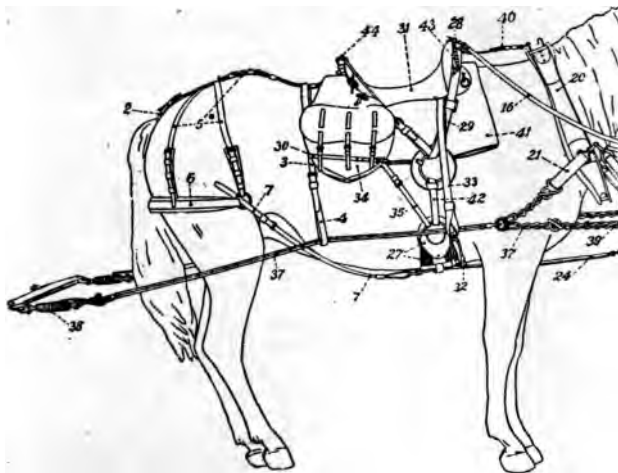
Extractor lever	Mounted on hinge pin.
Operating lever	Pivoted on block carrier.
Lever pivot	Pivots lever on block carrier.
Lever latch	In operating lever.
Lever latch spring.....	In operating lever, lower part.
Lever latch pivot.....	In operating lever, lower part.
Block latch	In recess in carrier.
Block latch spring.....	Around latch bolt.
Firing lock case.....	In hub of the block carrier.
Locking bolt nut and pin..	On firing lock case, rear face of carrier.
Firing pin	In axle hole, center of firing lock case.
Firing pin spring.....	Around firing pin.
Firing spring sleeve.....	Around firing-pin spring.
Sear	In slot in firing lock case.
Trigger fork	Rear end firing lock case.
Trigger shaft	On rear end firing lock case.
Trigger shaft detent.....	On trigger shaft.
Firing pallet	On pallet shank.
Pallet shank	On recoil lug of gun.
Firing handle	On firing handle shaft.
Firing handle bracket.....	Attached to right side of cradle.
Firing handle shaft.....	Assembled in bracket, right side of cradle.
Trip latch	Attached to trip latch plunger.
Trip latch plunger.....	Assembled to firing handle.
Adjusting screw	Assembled to firing handle bracket
Check nut	Assembled in adjusting screw.

INSTRUCTION IN MATÉRIEL

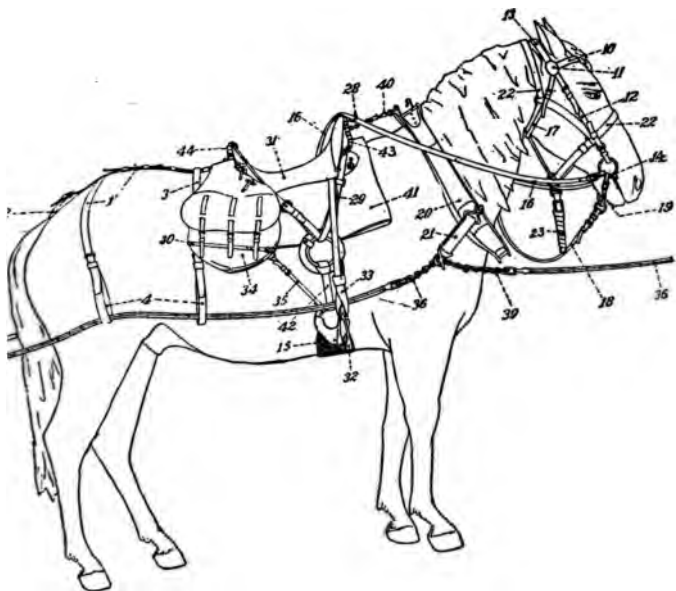
Theoretical Questions.—Nomenclature of Harn

No. on Plate I	Component Parts	No. on Plate I	Component Par
1-4	Backstrap and crupper, complete, consisting of—	11	Brow-band ments
1	Body and hip straps	12	Cheek pieces
2	Dock	18	Coupling strap
3	Loin strap	19	Connecting str
4	Trace loops	13	Crownpiece
	Backstrap hooks	14	Snaffle bit, 1 of 1911
8, 9	Breast strap, complete, consisting of—	16	Reins (pairs)
8	Breast strap	17	Throatlatch
9	Breast-strap hooks	20	Collar, steel
2-7	Breeching, complete, consisting of—	21	Hame tug, pa collar
5	Backstrap (1) and hip straps (4)	40	Collar strap
6	Body	22, 23	Halter, comp., sisting of—
2	Dock	22	Headstall
	Backstrap hooks	23	Strap
	Side strap hooks	24, 25	Martingale, com consisting of
3	Loin strap	24	Martingale
7	Side strap	25	Cincha strap
4	Trace loops	28	Lead-rein and strap
10-19	Bridle, comp., consisting of—	29	Quarter s including safes, and c straps
10	Brow band		





Off Wheel Harness



Off Lead Harness



INSTRUCTION IN MATÉRIEL

oretical Questions.—Nomenclature of Harness

(Continued)

Component Parts	No. on Plate I	Component Parts
Martingale—(Continued)		3 links
Cincha strap, part of saddle quarter strap		1 chain
Coat strap, 33" (pommel)	37	1 toggle
Coat strap, 45" (candle)		2 sockets
Coat strap, 60"		2 cones
Saddle, comp., consisting of—		2 filler pieces
Cinchas, with reinforcements and loops		Traces, wheel, model of 1908, consisting of—
Cinchas, without reinforcements and loops		1 trace body
Saddletree, leather covered		1 trace cover
Stirrups, brass (and new style nickel steel)	38	1 ring
Stirrup straps		2 sockets
Saddlebags		2 links
Saddlebag side straps		2 chains
Traces, lead, model of 1908, consisting of—		2 toggles
1 trace body	41	2 cones
1 trace cover		2 filler pieces
		Mogul spring, a part of wheel trace
		1 loop hook
		1 ring
		1 Mogul spring loop
		1 locking strap
		Whip
		Sweat leathers
		Blanket, issued with harness

Steel Collars

Steel collars are made in the following sizes: 2A, 2B, 4B, 5, 5A, 5B, 6, 6A, 6B, 7, 7A, 7B, and 8A. The A and B shapes have straighter sides than the number 5, 6, or 7.

There are seven sizes of pad connections and seven, numbered from No. 0 to No. 6, increasing in width as number increases.

Nomenclature of important parts of carriage:

Wheels and wheel fastenings.

Axle.

Rocker.

Trail.

Cradle.

Cylinder.

Elevating mechanism.

Traversing mechanism.

Traversing and elevating lock.

Top shield.

Main shield.

Apron and apron latches.

Brake.

Axle seats.

Ammunition carriers.

Range quadrant case.

Panoramic sight case.

Front and rear sights.

Details of parts of carriage:

Wheels:

Tires and tire bolts.

Felloes and joint clamps.

Spokes.

Hubs and hub caps.

Hub liners.

Oil valves.

Wheel fastenings, hasps, and split pins.

Cradle:

Cradle body, cradle head, and rear end.

Bracket supports for front and rear sights.

Recoil indicator, recoil indicator guide, and throw.

Bracket seat, firing shaft and handle.

Shoulder guard. Dust guard.

Retaining ring with bolts and fastenings.

Spring support guides.

Cylinder:

Cylinder with cylinder end screwed in.

Cylinder end stud and stud nut.

Counter recoil buffer.

Cylinder head.

Gland and packing rings.

Head retainer.

Piston head and piston rod.

Piston rod nut.

Cylinder—(Continued)

Filling plug, in end of piston rod.

Drain plug, in cylinder head.

Spring support.

Counter recoil springs.

Trail :

Flasks.

Axle bearings.

Elevating gear transoms.

Tool-box transoms.

Wheel-guard transom.

Tool-box bottom, lid fastening.

Rear sight-box bottom and cover.

Wheel guards.

Cover plate.

Float.

Spade.

Lunette.

Handspike.

Trail handles.

Trail seats.

Sponge-staff socket and fastening.

Nomenclature of parts of the limber :

Wheels and axle.

Middle rail.

Side rails.

Pintle.
Double tree.
Single trees.
Pole.
Implement attachments.
Chest.
Door.
Vertical diaphragms.

Nomenclature of parts of the caisson:

Wheels and axle.
Middle rail.
Side rails, from lunette to pintle.
Caisson prop.
Apron.
Road brake.
Fuse-setter bracket.
Implement attachments.
Chest.
Door.

Oils for Artillery Matériel

For the service, cleaning, and preservation of this matériel the Ordnance Department issues hydroline oil, lubricating oil (engine oil No. 1), clock oil, sperm oil, coal oil, neat's-foot oil and light slushing oil. Each of these oils is suited for particular purpose for which it is issued, as stated below, but care should be taken that it is not used for other purposes. The hydroline oil is for use in the recoil cylinders of the riages and for no other purpose.

oil and each piece then wrapped in paper to prevent the oil from being rubbed off.

Description of the 3-inch Field Gun, Model of 1904

The 3 inch field gun, model of 1904, uses the same ammunition as the 3-inch field gun, model of 1902, and the guns are practically the same, with the exception of the breech mechanism.

The gun is a built-up construction, of nickel steel, and consists of a tube, jacket, locking loop, and clip hoop, which is shrunk on near the muzzle of the gun.

To Dismount and Assemble the Elevating Screws

To dismount the elevating screws: Remove the elevating pin; unscrew the inner screw by hand; remove the elevating-screw cover; remove the outer screw by screwing it down through the elevating-gear bracket. Assemble it in the reverse order.

To Disassemble the Hand Fuse Setter

The hand fuse setter should be disassembled from time to time and thoroughly cleaned and oiled. To disassemble: Remove the corrector scale, unscrew the clamp screw, remove the clamp shoe. Remove plug, unscrew the base from the case, withdraw the range-ring carrier with the range ring, and handle from the case. Clean thoroughly, oil, and assemble in reverse order. To turn over the range ring it is necessary to remove the handle from the range-ring carrier by removing the six handle screws and then remove the four range-ring screws.

With the new design of corrector scale the sliding index must not be removed from the scale, as small parts may be lost and difficulty will be experienced in reassembling. Assemble in reverse order.

For this purpose there are issued blank-cartridge cases, black powder in bulk, tight-fitting felt wads, rubberine, or other quick-drying paint, primers, etc.

Before assembling the cartridge cases should be carefully inspected to see that they are in sound condition and thoroughly clean and dry. They should also be tested by trying them in the gun, to determine whether they have become deformed. Any cases that do not readily enter the chamber in the gun or that are otherwise seriously deformed should be laid aside for resizing. After inspecting the cartridge cases the black ammunition should be prepared as follows:

- (a) Insert the primers with the primer-inserting press.
- (b) Pour into the cartridge case the proper weight of black powder and shake it down well. The charge is $1\frac{1}{2}$ lbs.
- (c) Insert the felt wad and press it down hard until it rests squarely on the powder charge.
- (d) Give the upper surface of the felt wad and the inside of the cartridge case just above the wad a good coat of the rubberine or other quick-drying paint furnished for the purpose, using a brush, and allow the case to stand until this coat is dry. Then apply another coat of rubberine paint in a similar manner. The object of using rubberine paint, which is strongly adhesive, is to thoroughly seat the joint between the wad and the case to prevent any powder grains from leaking out, and at the same time to firmly hold the wad in place.

Precautions to be Observed

Firings with blank metallic ammunition will be greatly facilitated by a careful observance of the following:

Before all firings a careful examination should be made of the assembled rounds to see that the felt wads have not become displaced or the cartridge cases dented or deformed by careless handling. If the cartridge cases have been properly resized and are clean, no difficulty should be experienced in inserting them in the gun, provided the chamber of the latter is clean. The continued insertion of cartridge cases that

but the right ammunition carrier must be removed from the carriage before the cradle can be traversed far enough to permit the removal of the link. Assemble the mechanism in the reverse order.

Adjustment of Brakes

To adjust the road brake: The connecting rods are disconnected from the brake beams. The brake shoes are placed with the clearance from the tire desired, the brake lever with handles in extreme forward (released) position. The length of the connecting rods should then be adjusted to correspond. Should test show that one shoe bears harder on one wheel than the other, the connecting rod of the latter should be lengthened.

In washing cartridge cases this solution should be used hot and in sufficient quantity to completely immerse the cases.

Neither acids nor solutions of acids will be used for cleaning cartridge cases.

Practical Adjustment of Harness

The **bridle** should be adjusted so that the snaffle bit just touches the corners of the lips, but does not compress them, the throat latch should always be loose.

The **saddle** should be placed on the horse so that about three fingers can be placed between the front end of the side bar and the rear of the shoulder blade. The blanket should be raised slightly in the pommel arch so that when the horse is cinched the blanket will not be drawn tight across the withers. The cincha should be loose enough to allow the finger to be readily placed between it and the horse's belly.

The **collar**, when adjusted, should freely admit the thickness of the hand between the lower part of the collar and the throat, and, when pulled to one side, should admit the thickness of the fingers between the sides of the collar and the neck. A short collar chokes a horse by pressing on the windpipe; a narrow one pinches and rubs the neck. A broad collar works about and galls the shoulders. More injuries result from collars that are too large than from collars that are too small.

The **back strap**, when adjusted, should admit the breadth of the hand between it and the horse's back.

The **collar strap** should not be tight; otherwise it will pull the saddle forward on the withers. The surcingle, when used, should be buckled on the near side of the near horse and on the off side of the off horse, less tight than the girth and over it.

The **breech strap** should be adjusted so that it will bear quickly when the horse is required to check the movement of the carriage, but will not impede his movement while in draft. This adjustment is most important. It can best be made by observing the horse in draft and tightening the straps as much

as can be done without impeding the free movement of the animal while in draft.

The hip straps should be of such length that the breech strap will bear just below the point of the buttocks. The lower the breech strap is adjusted the less does it assist the horse in checking the movement of the carriage.

The loin straps should be so adjusted that the traces, when in draft, will be straight and without downward pull on the loops that support them.

The traces.—The length of the lead and swing traces must depend in a great measure on the size of the horse and his stride. The rule for lead and swing pairs is to allow about one yard from head to point of buttocks when in draft. The length of the wheel trace is fixed, but allowance may be made for difference in the size of the horses by proper adjustment of the martingale and sidestraps. This will allow a minimum distance of about 14 inches between hindquarters and single-tree for the average wheel horse when in draft. The traces should be adjusted so that the direction of the trace shall be as nearly normal to the shoulder as possible.

The rear trace chains of the lead and swing traces have a ring at one end and a hook at the other; the hook is passed through a "D" ring at the end of the trace and hooked back into any desired link. By this means the length of the lead and swing traces may be adjusted.

To Dismount and to Assemble Parts of the Breech Mechanism, Model 1902

No tools are required for these operations except, possibly, a hook for removing the cover locking pins. The lanyard hook can be used for this purpose. In general, the different parts are easily assembled by hand, and no forcing is required and none should be permitted. No part of the mechanism should be struck directly with a hammer. In case it is found necessary to use force (as, for example, to remove the lever latch pin) a copper drift or a piece of wood should be interposed between the part and the hammer.

To remove the cover: Remove the cover locking pins by pulling them directly to the rear; open the breech of gun; slip cover from its seat.

To assemble the cover: Open the breech of gun; slip the cover into its seat on the rear face of block; insert cover locking pins into the locking-pin holes, forcing the pins directly to the front through the cover into the block.

To remove the cap, firing pin, firing-pin spring, cocking lever, sear, and sear springs: Remove cover as above; rotate block partly to its closed or locked position; unscrew cap; cocking lever, firing-pin spring, firing pin, sear, and spring may now be removed in the order named.

To assemble the above-named parts: Rotate the breech-block to a position midway between its open and closed positions; insert in their seats in the order named in the sear spring, sear, firing pin with firing-pin spring assembled on it, cocking lever (with stud pin to the rear), and finally screw the cap home on the end of the firing pin; rotate the block to the unlocked or open position and assemble cover.

To dismount the operating lever: Remove the cover and unscrew the cap as above; remove lever-pivot key and lever pivot; operating lever may be now lifted from its seat.

To assemble the operating lever: Remove cover and cap as above; place operating lever on its seat with gear teeth meshing correctly with those on block; insert lever pivot and lever-pivot key; assemble cap and cover as described above.

To dismount the lever latch: Remove the lever latch pin by pulling or shoving it from its seat. The latch and latch spring may now be removed from the lever. The lever latch and spring are assembled by placing them in their seats in the lever and then inserting the lever latch pin. The latter is a straight pin, split at its inner end to hold it in its seat.

To dismount the trigger: Remove cover and small parts of firing mechanism; open the breech and remove the operating lever; press the latch bolt against the face of the carrier and rotate the breechblock by hand past its closed position after one and one-half revolutions of the block, the

assist in igniting the bursting charge and also to prevent the loose grains of the bursting charge from getting into the tube. The case is filled with 252 balls about $\frac{1}{2}$ inch in diameter, which are assembled around the central tube and held in place by a smoke-producing composition.

When the bursting charge in the base of the shrapnel is ignited the head is stripped and the balls shot out in very much the same manner as are the shot from a shotgun. The bullets are scattered (due to the rotation of the projectile) in a cone, which covers an irregular oval-shaped area of the ground in front. The bursting charge increases the velocity of the bullets by from 250 to 300 feet per second. The smoke-producing composition burns, making a white ball of smoke, which helps to indicate the point of burst. Shrapnel is generally used against personnel (men and horses).

Common Steel Shell, also called high-explosive shell. The shell is composed of the Steel Case, Base Detonating Fuse, Base Cover, Rotating Band, and Bursting Charge (13.12 ounces of Explosive "D"). The common steel shell has a pointed, ogival head. The body is hollowed out to take the large bursting charge of Explosive "D" (the service high explosive). The base detonating fuse is screwed into and closes the opening in the base of the projectile. The base cover is put on over the fuse and is intended to prevent the possibility of powder gases entering the shell cavity and causing a premature bursting of the projectile.

This shell bursts on impact and with great force exerted in all directions (front, rear, sides, up and down) and is a powerful instrument for the destruction of material objects (guns, intrenchments, houses, etc.).

High-Explosive Shrapnel. This is a high-explosive shrapnel and is fitted with a combination fuse and a high explosive head. The case is of drawn steel with solid base. The rotating band is forced into an annular groove cut in the case 1.2 inches from the base. The front or mouth of the case is closed by a steel head forced in. The method of assembling the shrapnel to the cartridge case is the same as that for the common steel shell. The bursting charge is composed of a charge of loose black powder ($2\frac{1}{2}$ ounces)

gencies. In firing without the latch the breech must be opened and closed slowly and gently to insure the correct sequence of the swinging and rotating motions.)

To dismount the block carrier, extractor, and extractor lever: Open the breech of the gun and remove the hinge pin; the carrier, extractor lever, and extractor may now be removed from their seats.

To mount the block carrier, extractor, and extractor lever: Place the extractor in its seat in the breech recess; place the carrier in position with its hinge hole registering with the holes in the hinge lugs of the jacket; place the extractor lever in position with its small end in the slot in the extractor web and its flat side to the front; insert the hinge pin.

To dismount the trigger arm and trigger-arm sleeve: Remove taper split pin from trigger arm; the latter may then be moved to the rear of the sleeve; shove the piece a few inches from battery; the sleeve may then be slipped to the front from its seat in the recoil lug.

Care of the Gun

After firing, the bore of the gun should be cleaned to remove the residue of smokeless powder, and then oiled. In cleaning, wash the bore with a solution made by dissolving one-half pound of sal soda in one gallon of boiling water. After washing with the soda solution, wipe perfectly dry, and then oil the bore with a thin coating of the light slushing oil furnished for the purpose. A slush brush for use in oiling the bore will be issued by the Ordnance Department upon requisition.

The breech mechanism should be kept clean and well oiled. It should be dismounted from time to time for examination and oiled when assembled. To relieve the firing-pin spring of unnecessary strain the firing pin should always be uncocked when the gun is not in use. This applies to guns, model of 1902 only. The spare parts carried in the trail box or in the battery wagon should be well coated with vaseline or heavy

estimation of distances is all guess work. One officer, in a test covering hundreds of trials, estimated ranges with an average accuracy greater than the Goerz range finder. Constant practice will give a fair degree of proficiency to any person with good eyesight.

SUBJECT 4.—RECONNAISSANCE REQUIREMENTS

Reconnaissance.—To include the reconnaissance of a road or trail not less than 3 miles long leading to a position suitable for the branch of Field Artillery in which the candidate is serving and from which at least six appropriate targets can be seen. The same road and position will be used for all the candidates examined on any one day and, if practicable, all the candidates serving at any one post will be examined in this subject at the same time. Before starting, a tactical situation will be assumed by the examiner and announced to the candidates, who will be required to move over the road at a gait not less than 5 miles per hour, and submit a road report and a position report within 30 minutes after reaching the position.

The reports will be marked as follows:

Neatness and appearance on a scale of 2.

Accuracy on a scale of 8.

Time on a scale of 2, one unit being deducted for each 5 minutes or fraction thereof, beyond 20 minutes from time of arrival at position.

In marking the accuracy of the road report, the report will be compared with the road itself, with a view to determining to what degree the candidate included or failed to include the information which would be desirable for an Artillery commander to receive before taking his command over an unknown road.

In marking the accuracy of the position report, the report will be compared with the conditions actually existing at the

From: V.T. SANDERSON, CANDIDATE, 1ST Bn. N.E.

At: INTRENCHED RIDGE

Date: 26 JUNE 1917 Hour: 9:30 AM. No. 1

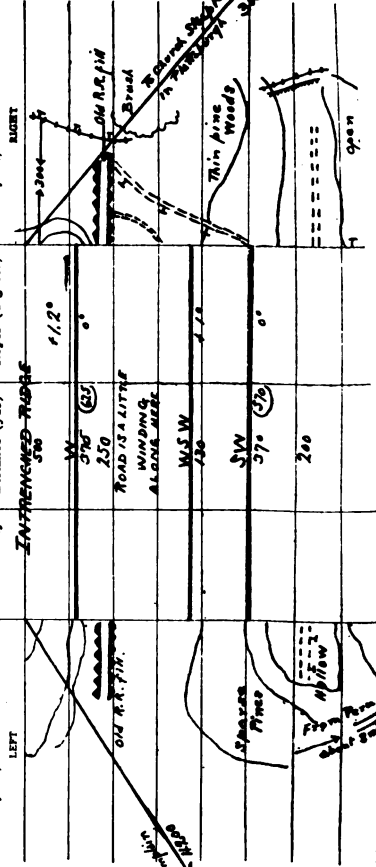
To: C.O. 1ST Bn. NEW ENGLAND REGIMENT

ROAD REPORT from: Coy. So. Peru Rd. to Monty St., West of Plattsburgh Barracks

via So. Peru Rd. to Intrenched Ridge

TOTAL DISTANCE 3375 yds, about 2 miles

Graphical description of: Roads, RR., trails, prominent features or objects, etc. Remarks.



reported upon, with a view of determining to what candidate included or failed to include information would be desirable for an Artillery commander to refore occupying the position.

umber of targets found and included in the report will ared with the number actually visible from the position through the field glasses supplied to the candidate and considered in determining the credit given to the candidate's accuracy.

ial Regulations No. 53, Par. 46.)

INSTRUCTIONS

Reconnaissance

the requirements stated above, it will be noted that candidate must submit the following:

oad report.

osition report, which contemplates also the construction of a rough position sketch to accompany the position

1. Road Report

report is made on a blank form similar to that shown in Figure 2, one side of which is used for the position report and the reverse side for the road report. These blanks, if readily on hand, may be ruled out on a sheet of blank paper 11 x 13".

Figure 2 shows a sample road report.

The report covers the South Peru road from the corner of the road and Monty street in a general southwesterly direction to the Intrenched Ridge. This is stated on the first page of the report.

The candidate should here turn to Figure 2 and follow the instructions for the completion of this report as described below. This will show the candidate what points as to road and terrain should be noted and what should be recorded on the road report.

The candidate may also refer to the road sketch (Figure 8) which covers the identical terrain.

Explanation of Figure 2

The candidate, mounted, starts on the South Peru road at Monty street, as indicated at the bottom of the sheet.

He proceeds forty yards, measuring this distance by means of a time scale previously constructed.

He notes an unimproved road on his left extending in a southeasterly direction.

Two hundred yards further he notes another unimproved road also running southeast. He notes that both lead to the Keesville road, which is eight hundred yards away, and which he knows extends in the direction indicated on the report.

He now fills in, in the proper column, a description of the road on which he is traveling, sufficient to indicate to anyone reading the report how much traffic it will take, and repeats this operation at convenient points until he reaches his destination.

The candidate observes that to his right is a cultivated field and some woods.

Two hundred yards beyond these, he notes a third unimproved road running a short distance to the south, and ending at a barn on the edge of some thick, low brush. This brush, from now on, continues sometimes near the road, sometimes well back.

One hundred and forty yards beyond this road, on the right, is a farmhouse with barn, windmill and greenhouses.

A hundred yards further on he comes to a cultivated field, over which he sees, among the trees, a prominent white monument in a cemetery, beside a house, both at a distance of about four hundred yards.

He passes some woods on the right and comes to a road going north to Plattsburg. At the corner there is a cemetery.

Two hundred and ninety yards further on, a trail leads off into the brush at the left, and a hundred and sixty yards from this point an unimproved road, twelve feet wide, as

indicated in the column headed "Condition and Practicability," runs west.

So far the candidate has not changed direction, and has come up a slope of less than half a degree.

The candidate has now reached a point 1,400 yards from his starting point. He now turns off the main road and proceeds on this dirt road to the west. His course on the new road is marked in the same column and in the same manner as previously. At a hundred and sixty yards from where he left the macadam road and started on the dirt road, he comes to two small farm-houses on the right and a small cultivated patch, forty yards beyond which is a mailbox marked D. ANQUETTE.

In this two hundred yards he finds by sighting along his board that he has gone **down** a slope of two degrees.

Here the road turns toward the northwest, up a two and one-half degree slope for a hundred and fifty yards and then, on an open ridge, there is a bend to the west-southwest. Two hundred yards farther on is a hollow through which a trail runs at right angles to the road. Here it is noted that the telegraph lines, which had been on both sides of the road until now, both swing to the left on this trail.

To the right, through the brush, can be seen a short stretch of railroad.

Three hundred and seventy yards beyond this point there is a fork, and the candidate takes the branch to the south-west.

Here the road runs through pine woods, and for the next hundred and thirty yards rises up a one-degree slope at the top of which it swings to the west-southwest.

A little farther on, to the right, there is a trail.

The road is winding along here, and two hundred and fifty yards from the last marked turn an old railroad fill crosses the road.

To the right, in the brush, can be seen a railroad track about three hundred yards away.

Three hundred and fifty yards from the fill the road turns West. Five hundred yards farther on, up a one and two-tenths degree slope, the candidate stops at the position chosen on Intrenched Ridge.

It will be noted that, although the requirements call for a sketch of a road 3 miles long for instruction purposes, the model report covers only about two miles.

To form a comprehensive idea of the instruction in reconnaissance, panoramic sketching and road sketching, it will be noted that the road sketch (Figure 8), and the road report (Figure 2), cover the same terrain. Furthermore, the position report and sketch (Figure 3), and the panoramic sketch (Figure 7), refer to the Intrenched Ridge at which both the road report and road sketch terminate.

Hints

In making a road report the following hints (found on the reverse side of the blank form for road reports should be borne in mind) :

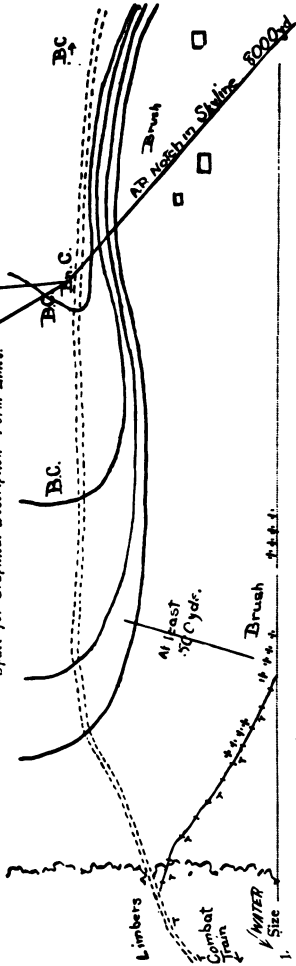
1. General direction.
2. Kind, improved, or unimproved.
3. Present condition, character of soil (sand, clay, etc.).
4. Level or hilly; gradients of hills.
5. Practicable for artillery at any gait; at walk only.
6. Any pioneer (repair) work necessary.
7. Nearest repair materials.
8. Defiles (causeways, narrow valleys, mountain passes, etc.).
9. Bridges (strong enough for light or heavy artillery).
10. Fordable and unfordable streams.
11. Watering facilities.
12. Camp sites.
13. Practicability for artillery to leave road and move across country.

ARTILLERY POSITION REPORT.

BC. WATER TOWER
 BC. HOTEL CHAMPLAIN
 BC. BATTERY

Location: INTRENCHED RIDGE 1 3/4 miles S.W. of PLATTSBURG

Space for Graphical Description—Form Lines.



Large enough to accommodate an artillery regiment.

Cover (defilades) Flash defilade for all batteries

Field of fire (sector, minimum and maximum ranges) Sector: White House, Left - Champlain

5. Approaches and exits (whether under cover from the enemy or not.) Approaches to positions covered for all batteries in rear of ridge.

6. Protection of flanks (whether afforded by friendly troops, or by natural features of the terrain.)

Flanks protected by infantry which we are supporting.

7. Aiming points (any available, good or poor.) South edge group of trees on skyline just South of cleft in ridge 8000 yards to west

8. Presence of friendly troops. Two regiments of infantry intrenched along top of ridge to our front and flanks.

9. Indications of the enemy. Two lines of infantry directly across Peau Road and west of pine woods 1200yds - Battery in position near farm house at rt of sector 1800yds. M.G. Battery and Infantry near white house at left of sector 1400. - B.C. Station 75m/ls to L of R in edge of woods.
10. Positions and protection for limbers and combat train. Limbers in woods about 200yds E. of Battery positions. Combat train at about 800yds to E. of Battery positions.

Signature

Rennett Sanderson, cand.

14. Existence of intersecting roads, with direction and destination.

15. Description of prominent points or objects which help identify road.

2. Position Report

A sample position report is given in Figure 3.

The points to be covered in the position report are:

1. Position masked for flash, mounted or sight defilade.
2. Position of limbers.
3. Position of horses of the specialists.
4. Minimum range to clear the crest.
5. Designation of Reference Point.
6. Designation of Aiming Point.
7. Number targets visible and character of each.
8. Sector covered.
9. Position of the observation or B.C. Stations.
10. Field of fire.
11. Protection, whether afforded by friendly troops or by natural features of the terrain.
12. Location of nearby friendly troops.
13. Overhead cover.
14. Watering places, if any, near at hand.

A blank form will be issued each candidate on which he will make his position report.

The space at the top of the form marked "Space for Graphical Description—Form Lines," is used for a position sketch. This is filled in above the position report in Figure 3.

The necessary equipment for constructing a position sketch is a drawing board, compass, medium soft pencil, eraser and paper.

The scale is 6 inches—one mile; and the contour interval is 10 feet.

As a position sketch contemplates the sketcher going on foot to the principal points of the terrain, you must first construct for yourself a pace scale as follows:

Count the number of your paces in a mile. Consider you paced 1,540 steps in the mile. Lay off A.B. (See Figure 4), equal 6 inches and divide A.C. in fifteen equal parts and one part equal to $\frac{4}{10}$ of the other divisions. By means of parallel lines you now divide the line A.B. into divisions, which represents 100 of your paces on a scale of 6 inches equals one mile. In pacing be careful to walk at your natural gait and to take your normal step.

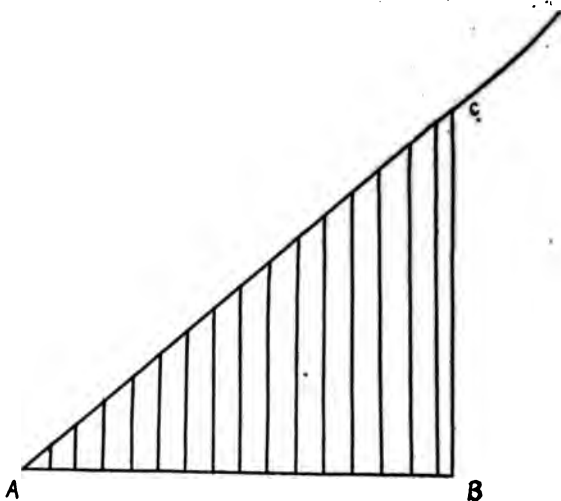


Figure 4

Having constructed your scale select a base line about $\frac{1}{3}$ the length of the longest dimension of your sketch. Pace base line and draw it on your sketch. From each end of line orient your sketch and draw lines to principal points the terrain. The intersection of these lines will locate the principal points on your sketch. This is called location intersection. Having located these points any other points the terrain, to which you may go, may be filled in by orienting your sketch at that point, locating two prominent points toward you from those prominent points, their intersection locates the point on which you stand in the sketch. This is called location by resection.

This gives you a frame work, see Figure 5, on which you can locate all features, which are of military value, and particularly all points mentioned in your position report. A few of these may be helpful.

Do not waste too much time with conventional signs, such as "woods," "cult." (for cultivated), "swamp," "grazing" or other appropriate words, which will save time and not detract from the value of your sketch.

If the country be featureless, set out stakes or small flags and use them as you were instructed above to use prominent points of the landscape.

Be sure to locate on your sketch an easily recognized orientation point.

Mark the following points on your sketch:

- (a) Second gun of the battery.
- (b) Position of limbers.
- (c) Position of the A.P., or a line indicating its direction and distance from B.C. Station.
- (d) Position of the B.C. Station.
- (e) Location of supporting friendly troops.

Place a flag or stake in the ground where the second gun is to go.

Frame Work of Position Sketch.

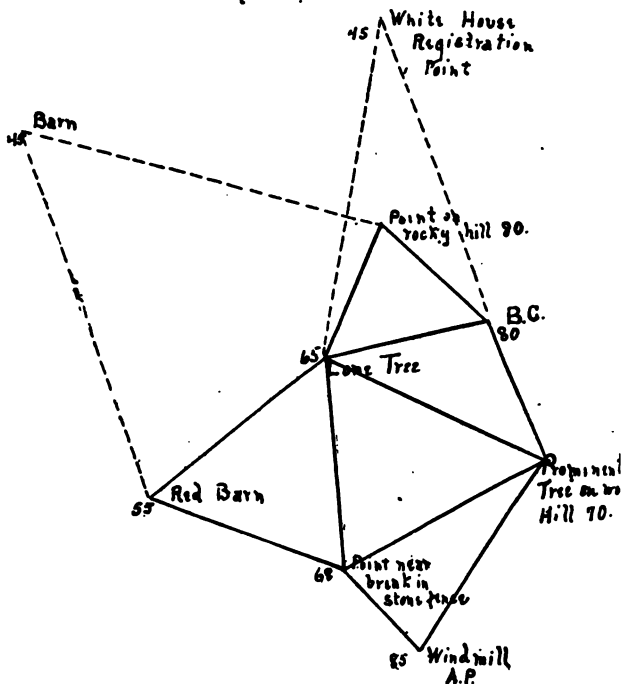


Figure 5

6. Compute the firing data and write it down on your sketch.

7. With the B.C. telescope or the B.C. ruler measure site to the prominent points in the terrain, compute these observations into yards as described under the heading calculation.

of the site. Note the elevations on your sketch, they will help you to fill in the contours.

8. Contours are the traces formed by imaginary, parallel, horizontal planes in the terrain of your sketch. These planes are 10 ft. in vertical height from each other and so each trace, or each contour is at an elevation of 10 ft. from the adjacent one. The accompanying sketch, Figure 6, illustrates the contours.

Figure 5 shows the frame work used for the construction of the position sketch. The elevation of the initial point on the sketch, in this case the B.C. station is taken from a larger map, as 80 ft. above sea level. By means of the B.C. telescope or the B.C. ruler (using the distant horizon as 300) the site to all prominent points on the landscape are read, computed to yards, then to feet and entered in the frame work of the sketch. Having the elevations of all prominent points, a very little practice is required in order to fill in the contours with sufficient accuracy for the purpose of the sketch. An allowance must be made for the height of the B.C. telescope or B.C. ruler above the ground.

For example the elevation of the base of the Red barn was taken from the B.C. station. It read 296, at a range of 2,500 yards, or was 10 yards or 30 ft. below the observing glass of the B.C. telescope. We allow 5 ft. for the height of the B.C. instrument, so the elevation of the Red barn is 25 ft. below the B.C. station or 80 minus 25, or 55 ft. above sea level.

The above instruction simply indicates the methods employed in constructing a position sketch. Unless the candidate is very expert and rapid, it will not be possible for him to construct a sketch in such detail. Moreover, all that is demanded by the examination requirements is the simple geographical form lines shown in Figure 6.

Note the Panoramic Sketch (Figure 7), the Road Report (Figure 2), and the Position Report (Figure 3). All refer to the same terrain. Figure 5 and Figure 6 (illustrating the construction of a position sketch), refer to a different terrain.

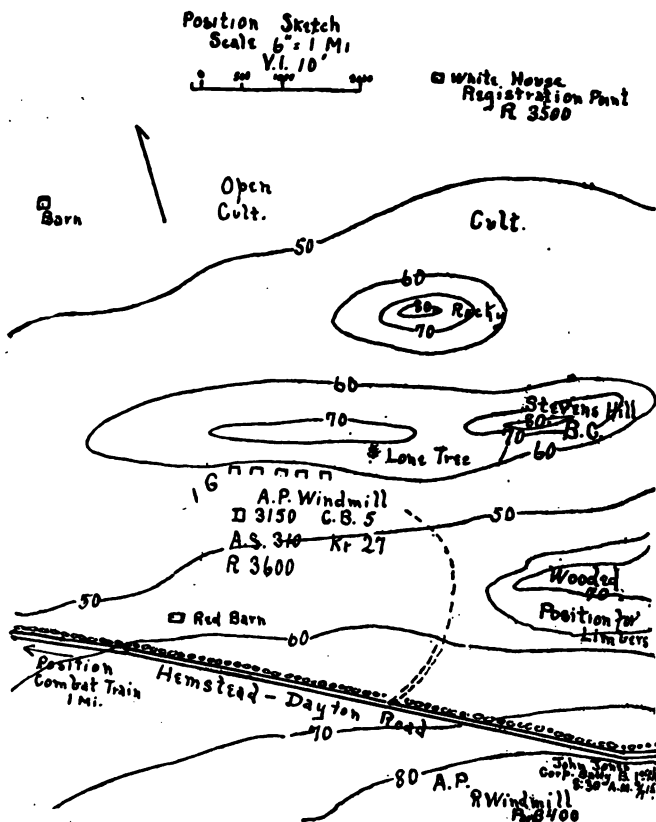


Figure 6

[114]

SUBJECT 5.—PANORAMIC SKETCHING REQUIREMENTS

Panoramic Sketching.—To include the preparation of a panoramic sketch of a given sector made from an Artillery position selected by the examiner from which at least eight appropriate targets or prominent features which could be used as registration marks can be seen through the type of field glasses supplied to the candidate.

The same positions and sectors will be used for all the candidates examined on any one day, and, if practicable, all the candidates serving at any one post will be examined in this subject on the same day.

No credit will be allowed for any sketch not submitted within 10 minutes.

The sketches to be marked as follows:

Neatness and appearance on a scale of 2.

Accuracy on a scale of 6.

The sketch will be marked on the basis of its value to an Artillery commander. Such value will be determined by a comparison of the configuration of the prominent portions of the terrain as shown in the sketch with the actual configuration, and by comparison of the number, direction, and kinds of targets or registration points shown on the sketch with the number, direction, and kinds actually visible from the place where the sketch is made.

(Special Regulations No. 53, Par. 47.)

INSTRUCTIONS

Panoramic Sketching

A blank form or panoramic sketching pad will be issued each candidate.

The accompanying sketch, Figure 7, describes what is desired.

The following outlines what should be done:

First. Draw in the principal form or crest lines of the landscape in the sector to be sketched.

Second. Mark the most prominent point in the sector as your origin. If possible, locate this point of origin in the center of your sector.

Third. LOOK FOR TARGETS, the location of which is the important part of your sketch. When you find a target, put in its conventional sign in the target's proportional part of the sketch. If it is at a short range, put it in the foreground, do not put it way back on the horizon. Measure with your ruler the deflection from the target to the origin. The origin, being most important, its deflection is easier to read as you hold your ruler to it. Put the measured deflection of the target below the sixth horizontal line from the top of the sketch. Estimate the range and put it above the top horizontal line. Underline range if determined by range finder. Above the top horizontal line M.G. stands for Machine Guns, B for Battery, I. for Infantry, and C. for Cavalry, A. for Artillery limbered, L. for limbers, and B.C.Sta. for Observation Stations.

Fourth. As soon as you have all the targets you THINK are in the sector, pick out the most prominent objects of the terrain for use as registration points, put down their ranges and deflections, as you did for targets. Write the names of these objects as "White House" above the data line.

Fifth. Put in an arrow to show where the magnetic north lies.

Sixth. Mark your position and label it, for instance, "In-trenched Ridge."

Seventh. Write your name, rank, organization, the hour, the date and the condition of weather at the lower right-hand corner of the sketch.

Eighth. LOOK FOR TARGETS. You will be surprised to find targets standing out with distinctness after you have concentrated your vision on a particular point. Use your

glasses to the limit of their possibilities and search every corner of the landscape.

Ninth. If a range finder and B.C. telescope are available and time permits, check up your deflections and ranges.

SUBJECT 6.—ROAD SKETCHING REQUIREMENTS

Road Sketching.—To include the preparation of a road sketch of a given road not less than 3 miles long, traverse of the road to be made at a rate not slower than 3 miles per hour, 40 minutes being allowed for the completion of the sketch.

Each candidate will be allowed a horseholder, who shall be a man not instructed in road sketching.

No credit will be allowed for any sketch not submitted within 40 minutes after arriving at the destination.

The road sketches are to be marked as follows:

Neatness and appearance on a scale of 2.

Accuracy on a scale of 6.

Time, in minutes, from arrival at destination to submitting sketch, equal to or less than.....	30	35	40
Credits.....	2	1.7	1.

(Special Regulations No. 53, Par. 48.)

INSTRUCTIONS

Road Sketching

A road sketch is a map of the road passed over.

All maps are made to scale, *i. e.*, so many inches on the paper is equivalent to so many miles of country. The scale adopted for road sketches is 3 inches to the mile. To pass

over a straight road one mile long we would represent same by a double straight line three inches in length. The next point to consider is the method of determining the distance we travel. As this sketch is made while we are mounted, the method of determining this is by the rate at which our horse travels. If our horse walks at the rate of $3\frac{3}{4}$ miles per hour then we will travel over the road 1 mile long in 16 minutes. Also if our horse trots at the rate of $7\frac{1}{2}$ miles per hour we will travel over the 1 mile in 8 minutes.

The Scale

From the above it is seen that the sketcher must have some sort of scale and a watch. For mounted sketching it is customary to have one scale for the walk and the other for the trot. In the case cited above the horse walks the mile in 16 minutes and our scale would be made as follows:



Scale: 3 inches—1 mile.

Horse walks 1 mile in 16 minutes.

Therefore 1 mile 16 minutes—3 inches on sketch.



Scale: 3 inches—1 mile.

Horse trots 1 mile in 8 minutes.

Therefore 1 mile—8 minutes—3 inches on sketch.

For any other rate a scale can easily be made. The scale given is believed to be an average and should be used unless sketches are able to time their respective horses and construct their own scales. As accuracy counts in the test it is believed that the scales used should be checked up by an officer before the test is made.

Equipment

Walk scale }
Trot scale } pasted or inked on a straight edged ruler.

Watch (stop watch preferred, if not available then watch with second hand).

Eraser.

Hard pencil.

Sketching board (with paper and thumb tacks).

Compass.

Note book.

Method of Procedure

Place board on the ground at the starting point, lengthwise in general direction to be sketched.

Place compass on board and draw north and south line.

Begin sketch at lower edge of the paper.

Take a point of beginning and lay straight edge on point and sight on some distant point on road to be sketched. The straight edge now passes through point of starting and points toward distant point. Draw this line and make it of any convenient length.

Mount horse, take the time and proceed to distant point sighted on, dismount, lay off from starting point with the scale referred to a distance equal to the time traveled between the two points.

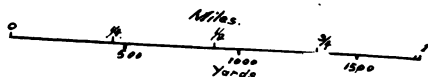
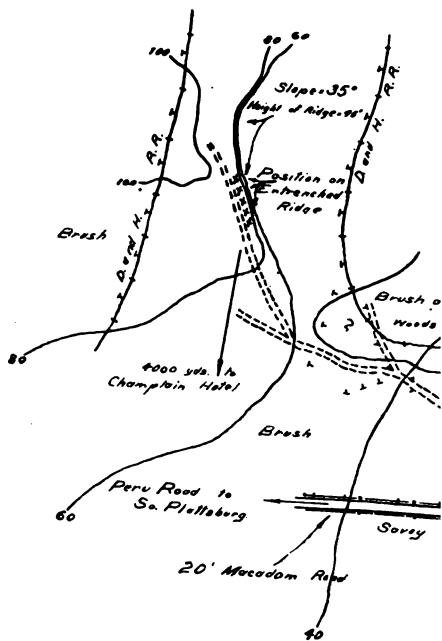
Draw in road and thus represent the road between the first two points.

Place compass on board and turn board until the north and south line you drew before starting out lies with the north pointing to the north as indicated by your compass.

Select a distant point on the road and proceed as before.

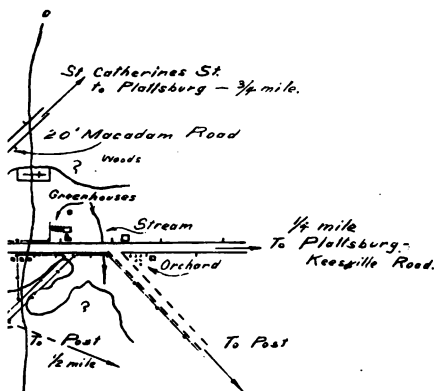
Use of Notebook

The above gives a simple method for sketching the road itself.



? ? Denotes Woods
impassable for F.A.
without pioneer work

Figure 8.



Roadsketch

From Orchard at Fork on
Perry Road to Entranched Ridge

Scale: 3" = 1 mile; V.I. = 20'

Distance = 2 1/4 miles

Time = 2 hours

Date: 22 June, 1917.

S.M. Foster, P.R. Bldg 1, N.E.

In addition to this it is necessary to show the character of the country passed over such as: Streams, lakes, marshes, intersecting roads, railroads, telegraph and telephone lines, houses, villages, bridges, etc., etc. A very easy way to meet this is to carry a small notebook with horizontal lines ruled in it. Let each line represent 30 seconds or other convenient interval of time, and as you ride along notice the time to any object or feature you desire to place upon your sketch and note same on the proper line of your notebook. It may be convenient to use the right side of sheet for objects on right side of road and left of sheet for the other side.

The character of the country and the features referred to above as required to be shown by a road sketch (see Figure 8) are best represented by Conventional signs, a list of which is printed on pages 121 and 122 of this handbook.

Elevations

The paper upon which the sketch is made is naturally flat. To show the road and adjoining country correctly we should show the principal hills or mountains. Contours are drawn in their approximate position in the sketch to indicate roughly the principal hills or mountains. The subject of contouring is discussed under position sketching. Should the candidate be totally unfamiliar with contouring, for the purpose of the test, it is believed sufficient to show the principal hill forms by means of writing the information on the sketch at the proper places and perhaps estimating the height thereof.

Accuracy is the principal requisite of a good road sketch, but considerable practice is required to gain the necessary speed. Neatness, while desirable, is of secondary importance.

ABBREVIATIONS AND CONVENTIONAL SIGNS

The following abbreviations and conventional signs are used on road and position sketches. Abbreviations other than those given should not be used.

ABBREVIATIONS.

A.	Arroyo.	G. S	General Store.,	Pt.	Point.
abut.	Abutment.	gir.	Girder.	q.p	Queen-post
Ar.	Arch.	G. M.	Gristmill.	R.	River.
b.	Brick.	l.	Iron.	R. H.	Roundhouse.
B. S.	Blacksmith Shop.	l.	Island.	R. R.	Railroad.
bot.	Bottom.	lc.	Junction.	S.	South.
Br.	Branch.	k.p.	King-post.	s.	Steel.
br.	Bridge.	L.	Lake.	S. H.	Schoolhouse.
C.	Cape.	Lat.	Latitude.	S. M.	Sawmill.
cem.	Cemetery.	Ldg.	Landing.	Sta.	Station.
con.	Concrete.	L. S. S.	Life-Saving Station.	st.	Stone.
cov.	Covered.	L. H.	Lighthouse	str.	Stream.
Cr.	Creek.	long.	Longitude.	J. G.	Isolate.
d.	Deep.	Mt.	Mountain.	Ires.	Irestia.
cul.	Culvert.	Mts.	Mountains.	tr.	Truss.
D. S	Drug Store.	N.	North.	W. T.	Water Tank.
E.	East.	n. f.	Not fordable.	W. W	Water Works.
Est.	Estuary.	P.	Pier.	W.	West.
f.	Fordable.	pk.	Plank.	w.	Wood.
Fl.	Fort.	P. O.	Post Office.	wd.	Wide.

SIGNS—FIELD MAPS AND SKETCHES.

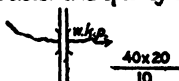
Telegraph Line	{	Symbol (modified below)	• • • • •
		Along improved road	=====
		Along unimproved road	- - - - -
Railroads	{	Along trail	- - - - -
		Single track	=====
		Double track	=====
		Trolley	=====
Roads	{	Improved	=====
		Unimproved	- - - - -
		Trail	- - - - -
		barbed wire	=====
Fences	{	smooth wire	=====
		wood	=====
		stone	=====
		hedge	=====

Bridge



Indicate character and span by abbreviations.

Example:



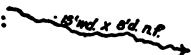
Meaning wooden king post bridge, 40 feet long, 20 feet wide, and 10 feet above the water.

Streams



Indicate character by abbreviations.

Example:



Meaning a stream 15 feet wide, 8 feet deep, and not fordable.

House -

Church *

School house = S.H.

Woods



Orchards



Cultivated Land



If boundary lines are fences they are indicated as such.

Brush, crops or grass, important as cover or forage



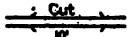
Cemetery



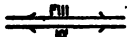
Trees, isolated



Cut and fill -



cut 10 feet deep



fill 10 feet high



SUBJECT 7.—USE OF TELEPHONES

REQUIREMENTS

Use of Telephones.—The equipment used will be that supplied to the command with which the candidate is serving. The examination will include the following: (1) The telephone at one end of the line in good order and properly connected being supplied, the candidate will be required to connect and operate a telephone at the other end, either on metallic circuit or ground return, as directed by the examiner, operation to include the transmission of assumed firing data in the manner prescribed in paragraphs 22 and 1124, Provisional Drill and Service Regulations for Field Artillery (Horse and Light) 1916 (see pages 133-4 this handbook); and (2) the candidate will be required to describe and make the following tests: The battery, the buzzer, including its adjustment, the speaking circuit, the receiver, the connections, the transmitter, and the line.

The candidate's theoretical knowledge of telephones, as shown by his familiarity with the principles involved in the tests required in the examinations, will be marked on a scale of 3, and his practical knowledge, as shown by his ability to make the connections and tests required and his operation of the telephones, will be marked on a scale of 7; total, 10.

(Special Regulations No. 53, Par. 49.)

INSTRUCTIONS

Use of Telephones

In order to understand the principles involved in the prescribed tests it is necessary that the candidate have a knowledge of how the telephone operates electrically.

Telephones are generally divided into two classes, namely, common battery and local battery.

In the first class the electric current used in operating all the telephones of a system is supplied by a central generating plant.

In the second class the electric current used in operating each telephone of the system is supplied by small batteries with which each telephone is equipped.

All portable field telephones and buzzers are of the latter class. In order to gain a general idea of what takes place in such an instrument there are certain phenomena that must be considered.

In transmitting speech by telephone, the following occurs:

- (a) The voice of the operator sets up certain vibrations in the air which our ears recognize as speech.
- (b) If these sound vibrations, instead of falling upon the nerves of the ear, fall upon some instrument in an electrical circuit in such a manner that variations in the current strength of such circuit are produced, we have the effect that is actually produced when we speak into the transmitter of a telephone, namely, the vibrations of the air caused by speech are transformed into electrical vibrations, or to make it clear, into variations in the amount of electric current flowing in the circuit of which our transmitter and battery form a part.
- (c) If, now, this circuit be joined to a distant telephone by electrical connections, the variations in current strength referred to in (b) are conducted through magnet windings in the receiver of the distant telephone. Everyone is familiar with the manifestations of a magnet, such as its ability to pick up needles, iron filings and the like. This principle is made use of in converting the variations in current strength back to vibrations of the air which our ears recognize as speech. A metal disc is placed in the receiver in such a manner that the magnets, through which the varying current is flowing, will attract the disc with varying degrees of intensity. This varying attraction of the magnet for the disc causes the latter to vibrate, and in so doing, vibrations are set up in the surrounding space.

Having gained something of an idea of what is accomplished, it is desirable to next examine into the different parts of the telephone, by which we are enabled to effect these results. These parts are the battery, for producing the electricity; the transmitter, for converting the air vibrations into variations in current strength; and the receiver for converting the variations in current strength back into vibrations of the air, which are recognized by the operators at distant stations as speech.

Figure 9 shows how a telephone of the simplest character may be set up to illustrate the action outlined above.

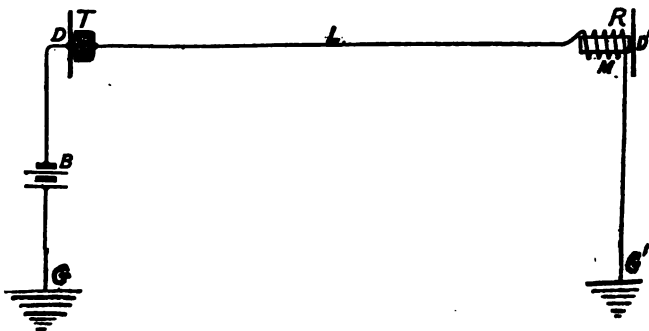


Figure 9

The current in this circuit may be traced as follows: From battery B to transmitter T, where it passes through the cylinder C, filled with loose particles of carbon; from C it passes along the line to receiver R at distant station. In R there is the magnet M, around which the current flows, thence to ground at G'; from G' through the ground to G, and from G back to B, completing the circuit.

If, now, vibrations of the voice strike against the disc D, it causes the disc to press with varying intensity against the carbon in the cylinder C. Since the current must pass

through this carbon, as shown in Figure 9, the difference in the pressure against the carbon particles will cause them to touch one another, sometimes snugly and sometimes loosely, and, in fact, with all varying degrees of intensity of contact.

The reader is no doubt familiar with the fact that a current passes through tight contacts of an electric conductor without losing strength, and that when it passes through loose connections, a portion of the current is lost, depending upon the imperfections of the contact; further, that where there is no contact at all, no current whatever passes. This is really what takes place in the transmitter. When one talks into the transmitter, the disc vibrates against the carbon particles, alternately packing them together and allowing them to fall away again, thus causing varying amounts of current to pass through the transmitter, which is the function we require of it. The following result is known to all: when a loud voice speaks into a transmitter, it packs the carbon together, permits more current to pass, and thereby causes a louder note at distant receiver than does a low voice.

We have now seen how to convert speech into variations in an electrical current, and it remains to be seen how it is we convert variations in electrical current back into vibrations of the air (sound).

Referring again to Figure 9, we observe how a varying current will emerge from the transmitter during speech. This varying current passing over the line L reaches R and passes around the magnet M. A bar of iron becomes a magnet if a current passes around it, and as such is called an electro-magnet. The stronger the current passing around M, the more it will attract the metal disc D'. Also if a small current passes around M, the attraction for D' will be slight. It is seen that as the varying current passing out of the transmitter passes around M, that M will attract D' with varying degrees of intensity, thereby causing D' to vibrate and convert the varying pulsations of current into articulate speech. Thus the loud voice which packed the carbon tightly causes strong pulsations of current to pass out of the transmitter and around the magnet of the distant receiver, which in turn strongly attracts D'. D' gives off loud vibrations, and loud

duplicates of the words spoken in the transmitter are reproduced for the ear at the distant receiver.

The simple circuit shown in Figure 9 is not practical for actual use, as it is desirable to have both a receiver and a transmitter at each station, so that we may modify Figure 9 as shown in Figure 10.

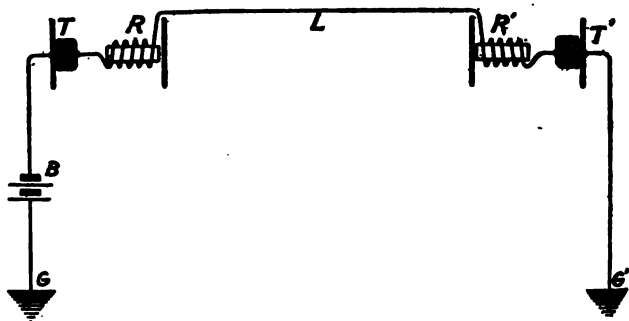


Figure 10

With a line set up as in Figure 10 conversation could be carried on over very short distances, but many refinements are added in the circuit actually employed in order to produce the efficient service telephones are expected to render.

The first important step toward perfecting this simple circuit is to obtain an electric current generated by a small battery suitable for operation over longer distances. This is accomplished by employing induction coils. The principle of the induction coil is briefly as follows (see Figure 11).

If a small number of turns of coarse wire are connected with a battery, as shown in Figure 11, and a great number of turns of fine wire are placed adjacent to, but not connected with, the coarse windings, the peculiar phenomenon of induction occurs. The action is briefly this:

When switch Sw is closed, current flows through the coarse wire windings. As this current passes around the core, a current springs up in the fine wire windings. This current is not like the original; it is much smaller, but flows under a greatly increased pressure or electro-motive force. This induced current flows whenever the current in the coarse windings rises or falls in strength. The operation is reversible; i. e., if a high current of high pressure, but of low strength, pass through the many turns of fine wire, a current of lower pressure, but with a much greater current strength, will be induced in the few turns of coarse wire. There are laws governing this action which are explained at length in various works on electricity, but it is merely the object here to state that this action does take place, and that it has been found convenient in practice to wind both the coarse wire and the fine wire on the same spool. The action of the coil is also aided by inserting a core of soft iron in the middle of the coil.

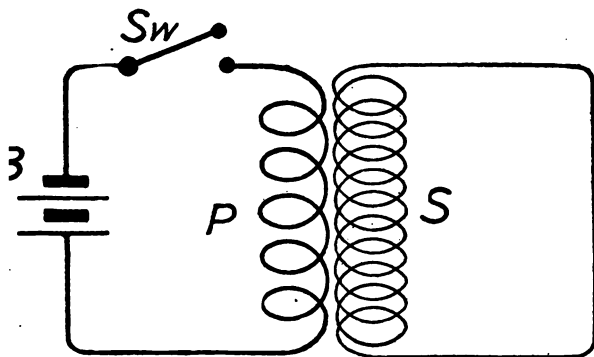


Figure 11

Reference to Figure 12 will show you, by the use of induction coils, that current that actually passes over the field wire of high pressure and small volume.

Consider operator as speaking in T. The current from B will vary because of action in T, and current will consequently vary as it passes through primary P of induction coil C. This causes small currents of high pressure to spring up in secondary winding S of induction coil C, which pass through receiver R, a station, over the line L, to distant telephone, and magnet windings of receiver R', where operator receives exact duplicate of the words spoken in T. From R' the current passes through S' to ground at G', and through to G, thence back to S, completing circuit. These small currents of high pressure are able to pass through long line of great resistance, where the original current as generated by B would be unable to penetrate.

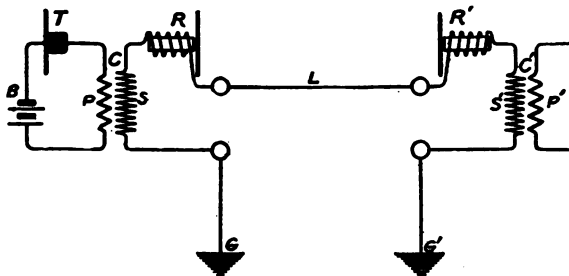


Figure 12

This is desirable from the fact that a current of volume and high pressure overcomes obstructions (resistance) in a way similar to the manner in which a small swift stream rushes over physical obstructions, while a current of great volume, but of low pressure, may be compared to a sluggish stream which fails to force its way along with the vigor of the smaller, but swifter stream.

THEORY OF THE BUZZER

It was decided that some form of calling device was needed for attracting the attention of the operators at distant stations. The bell, as a form of calling device, is familiar to all. This, however, is not a practical means for use in a field instrument because of the weight it entails, not of the bell itself, but of the device (magneto) that is necessary in order to generate sufficient power to operate a system of bells.

The means actually used in the service buzzer for calling is a buzzer or vibrator so arranged in the telephone that when the key is pressed a buzzing tone will be produced in the receivers at distant stations.

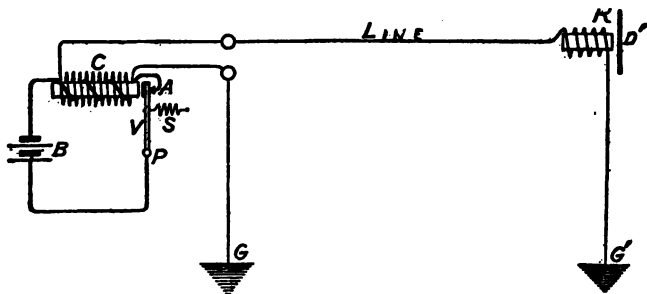


Figure 13

We have seen how wire carrying a current around a bar of iron will produce in the bar the properties of a magnet, *i. e.*, the iron will attract iron filings, metal discs, etc., as described under "the receiver." The operation of the buzzer depends upon this principle.

The magnet we use in the service buzzer is the induction coil described above. It will be remembered that this coil is made up of turns of wire carrying current around a spool, and, further, that the core of the spool is filled with soft iron. When current flows around the turns, the coil becomes

magnet like the electro-magnets in the receiver. If we approach a thin piece of iron to either end of the coil, it will be attracted while current flows around the coil, but the piece of iron will not be attracted with the same force when the current ceases to flow around the coil.

Reference to Figure 13 will show how this principle is utilized in operating a buzzer.

V is a strip of iron fastened at P. The top is held against A by means of the spring S. The current passes from B, around the primary winding of C to A, through V back to battery. When, however, current flows around C, the soft iron core is magnetized and the tip of vibrator is drawn toward the electro-magnet; this breaks the circuit at A, which stops the flow of current through C, and, therefore, demagnetizes the coil, and the spring S pulls the vibrator back until it makes contact at A. This alternate making and breaking of the current goes on at great speed. The effect of this on the fine wire winding of the coil C was explained under the description of the induction coil (pages 128-9), namely, that as the current through the coarse windings rises and falls, due to the alternate making and breaking at A, a small current of very high pressure is induced in the secondary winding of the coil. This induced current passes along the line to receiver R of a distant telephone, alternately magnetizing and demagnetizing the electro-magnet in the receiver, which in turn alternately attracts and releases the disc D'. The current passes to G', completes circuit through the ground to G, thence back to coil C. The rapid vibrations of D' make a buzzing noise which may be heard, under favorable circumstances, several yards from the instrument.

TO CONNECT UP THE INSTRUMENT

The equipment may be either the Field Artillery telephone or the service buzzer, depending upon the type issued to the command to which the candidate belongs. In either case the connection is the same, namely: Insert plug in jack and see that connection is made to the line, and in case of a single line, that connection is made to a ground rod and that the rod is inserted in **the** ground.

(NOTE: If either the type C or D connector is in use, see that the block screw is screwed down for a double (metallic) line and unscrewed for a single (grounded) line.)

In the later model Field Artillery telephone and the service buzzer, binding posts are inserted for use in case the line and ground rod are connected directly to the binding posts.

Be certain the connector teeth bite through the insulation and that the plug is shoved home in the jack.

TO USE THE TELEPHONE

Press the button on the transmitter while talking.

In speaking into the transmitter the head should be held in a natural position, the lips about an inch from the transmitter. The transmitter should be held with its face vertical or substantially in the position in which the transmitter on a commercial telephone is mounted. If held horizontally the granulated carbon in the receptacle of the transmitter may not touch the front carbon disc and the transmitter will not operate. In the 1914 model, switch should be first placed on "T" or "talk" side and should be protected from the wind.

In a high wind good results may be obtained by pressing the transmitter against the throat on either side of the wind-pipe.

Use a moderate tone of voice and speak slowly and distinctly, being careful not to slur the words or syllables, but to enunciate clearly each sound.

Never shout or raise the pitch of the voice.

Never use the word O for zero; when so used it is often mistaken for four. The digit nine being often difficult to understand, the word NINER may be substituted therefor.

If it is necessary to repeat, use more care as to distinctness, but do not raise the voice. A single number not understood may be accentuated by counting up to it and emphasizing it. Thus, if the figure 4 is not understood say FOUR; one, two, three. FOUR.

In receiving observe the following rules:

1. Keep the mind on the message; a person cannot receive correctly when he is thinking of something else.
2. Keep the receiver close to the ear.
3. Do not interrupt the sender unless absolutely necessary.
4. Caution the sender when he is speaking too loudly, not loudly enough, or too rapidly.

In transmitting numbers by telephone exact hundreds and thousands are so announced: of other numbers each digit is given separately, thus:

400.....Four hundred.
1800.....One, eight hundred.
3000.....Three thousand.
3225.....Three, two, two, five.
4050.....Four, zero, five, zero.

Tests

The object of tests is to locate troubles and may be made as follows, although many other methods may be used successfully:

Test of Speaking Circuit

Short circuit secondary circuit. This is done by connecting R and S of Field Artillery Telephone and by connecting the binding posts of the Service Buzzer. Place receiver to the ear, blow in transmitter. If speaking circuit is operative the blowing will be heard in receiver.

Test of a Battery

Detach a receiver that is working properly and touch its terminals to the opposite ends of the battery. A loud click will be heard if the battery is operative.

Test of a Receiver

Detach the receiver and touch its terminals to the opposite ends of a battery that is known to be operative. A loud click will be heard in receiver if it is operative.

Test of Buzzer

Press button or key and if operative it will be known by the sound. This is also an indication that the batteries are operative.

Adjustment of Buzzer

The buzzer is adjusted by means of two screws; the upper screw adjusts the air gap (the distance between the vibrating spring and the iron core of the induction coil) and the lower screw carries the current to the vibrating spring. First set the upper screw and turn lower screw until by pressing call button a strong buzz is heard. If no results are obtained try another setting of the upper screw and again turn the lower screw in and out. Proceed in this manner until the desired adjustment is obtained. If the battery is strong and the above fails to give adjustment, clean contacts on buzzer by running a smooth file or fine sand paper between lower screw and springs. When adjustment is secured the locking nuts with which both adjusting screws are provided should be carefully tightened.

Test of Connections

Tighten all loose nuts and screws.

Test all cords for breaks beneath the insulation.

Remove telephone or buzzer from case and examine wiring on reverse side of base plate.

See that plugs make connection in jacks. See, also, that connectors make a good contact with line and ground rod.

See that a good ground is secured.

Test of Transmitter

Make the tests outlined above. If speaking circuit is out of order and the other tests show that battery, receiver and connections are intact, the trouble has been quite definitely traced to the transmitter.

Test of Line

Where telephones that have been tested and found operative are connected to both ends of the line and operator at one station is unable to get distant station, proceed as follows:

(a) A grounded line—

Raise transmitter and if a click is heard in the receiver the line is probably grounded as a click indicates a complete circuit; if no click is heard, the circuit is open, which may be caused by very poor connections or a severed line.

(b) A metallic circuit, i. e., a double wire—

Make same test as in (a), if a click is heard, the line is probably short circuiting the two conductors, if no clicks are heard, the line is open.

SUBJECT 8.—VISUAL SIGNALLING REQUIREMENTS

Visual Signalling.—Two trials; one in sending and one in receiving a message or firing data of 100 characters, including numerals.

An assistant may be used to dictate in sending or to record in receiving. The board will provide operators for the other station.

The authorized semaphore code and letter code Field Artillery, will be used.

No credits will be given if, due to the fault of the candidate, the message is incorrectly sent or received in such a way as to alter or obscure the meaning.

If the message is correctly sent or received by the candidate, credits are given as follows:

Characters per minute, exactly or less than...	50	45	40	35	30
Credits.....	6	5.6	5.1	4.5	3.9

(*Special Regulations No. 53, Par. 50.*)

INSTRUCTIONS

Visual Signalling

Memorize this code. The two-arm semaphore code is prescribed for this test. (See Figure 14.) In addition to learning the code it is necessary that each candidate memorize the authorized abbreviations for visual signalling in field artillery as follows:

- A.... Error.
- AD.... Additional.
- AKT.... Draw ammunition from combat train.
- AL.... Draw ammunition from limbers.
- AM.... Ammunition going forward. Ammunition required.
- AMC.... At my command.
- AP.... Aiming point.
- B (numerals).... Battery (so many) rounds.
- BS (numerals).... (Such.) Battalion station.
- BL.... Battery left.
- BR.... Battery right.
- CCC.... Charge (mandatory at all times). Am about to charge if not instructed to contrary.
- CF.... Cease firing.
- CS.... Close station.
- CT.... Change target.
- D.... Down.
- DF.... Deflection.
- DT.... Double time. Rush. Hurry.
- F.... Commence firing.
- FCL (numerals).... On 1st piece close by (so much).
- FL.... Artillery fire is causing us losses.
- FOP (numerals).... On 1st piece open by (so much).

G.... Move forward. Preparing to move forward.
 HHH.... Halt. Action suspended.
 IX.... Execute. Go ahead. Transmit.
 JI.... Report firing data.
 K.... Negative. No.
 KR.... Corrector.
 L.... Preparatory. Attention.
 LCL (numerals).... On 4th piece close by (so much).
 LOP (numerals).... On 4th piece open by (so much).
 LT.... Left.
 LL.... Left, left.
 LR.... Left, right.
 MD.... Move down.
 ML.... Move to your left.
 MR.... Move to your right.
 MU.... Move up.
 N.... Annul, cancel.
 O.... What is the (R.N., etc.)? Interruption.
 P.... Affirmative. Yes.
 PS.... Percussion. Shrapnel.
 QRQ.... Send faster.
 QRS.... Send slower.
 QRT.... Cease sending.
 R.... Acknowledgment. Received.
 RS.... Regimental station.
 RL.... Right, left.
 RR.... Right, right.
 RN.... Range.
 RT.... Right.
 S.... Subtract.

GENERAL SERVICE CODE

FOR USE BETWEEN THE ARMY AND NAVY AND FOR COMMUNAL SIGNALING.

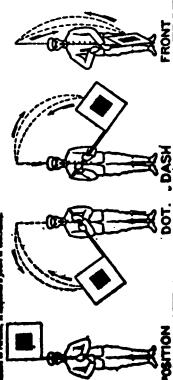
A	----
B	.....
C	.....
D	.....
E	.....
F	.....
G	.....
H	.....
I	.....
J	.....
K	.....
L	.....
M	.....
N	----
O	.....
P	.....
Q	.....
R	.....
S	.....
T	.....
U	.....
V	.....
W	.....
X	.....
Y	.....
Z	.....

NUMERALS

1	----
2	.....
3	.....
4	.....
5	.....
6	.....
7	.....
8	.....
9	.....
0	.....

CONVENTIONAL SIGNALS

1	.....	10	.....
2	.....	11	.....
3	.....	12	.....
4	.....	13	.....
5	.....	14	.....
6	.....	15	.....
7	.....	16	.....
8	.....	17	.....
9	.....	18	.....
0	.....	19	.....



POSITION

DOT

DASH

FRONT

FOR USE BETWEEN THE ARMY AND NAVY AND FOR COMMUNAL SIGNALING.

A	I	G	M	S	Y
B	2	H	N	T	Z
C	3	I	O	U	INTERVAL
D	4	J	P	V	NUMERALS
E	5	K	Q	W	
F	6	L	R	X	

SCL (numerals).... On 2d piece close by (so much).
SOP (numerals).... On 2d piece open by (so much).
SH.... Shell.
SI.... Site.
SSS.... Support needed. Support going forward.
SW.... Sweeping.
T.... Target.
TCL (numerals).... On 3d piece close by (so much).
TOP (numerals).... On 3d piece open by (so much).
U.... Up.
Y (letter).... Such battery station.

SUBJECT 9.—RECEIVING, CARRYING AND DELIVERING OF MESSAGES

REQUIREMENTS

Receiving, Carrying, and Delivering of Messages.—The candidate, mounted, will be required to receive from a member of the examining board a verbal message of about 10 words appropriate to Field Artillery service, and at the same time a written message addressed to another member of the board, to carry both messages to the member of the board for whom they are intended, deliver them, and return to the first member of the board with both a verbal and a written answer.

No credit will be given if there is an error in transmitting either the verbal message or the answer which, in the opinion of the board, would seriously change or obscure their meaning. The candidate to be marked on a scale of 3 on the correctness of his manner of receiving, carrying, and delivering the message, and on a scale of 7 for his accuracy; total, 10.

(Special Regulations No. 53, Par. 51.)

INSTRUCTIONS

Receiving, Carrying and Delivering Messages

When your turn comes for examination in this subject be sure your uniform and equipment is in adjustment. Approach the examining officer mounted. Come to a halt about 10 paces from him. Dismount. Pass the reins over your horse's head, and, holding the reins in your left hand, approach the examining officer. Halt about 3 paces from him and salute. In a firm, clear voice announce yourself, as for instance, "Sir, Corporal Jones reports as messenger," or, "Sir, Corporal Jones reports, as directed." Stand at attention while you receive your orders. Listen intently while the verbal order is given you. Repeat the verbal order before being told to do so, but not before the examining officer has completed his instructions. Repeat the verbal order in some such form as this,

"Major Brown directs Lieutenant Smith to submit position sketches in duplicate of the advanced position." Try to repeat the exact words of the examining officer. In delivering the message do not say Major Brown directs you to submit, etc. Remember there is no **you** in official conversations with officers. Always use the third person. In referring to an officer never say he directs so and so; always say the captain directs so and so. After you have received the written message place it in your pocket and button the pocket. After you have received both orders and the examining officer has signified "that will do" or some such direction, salute, mount your horse, and move out at a trot to accomplish your mission. In delivering the message halt and dismount as before. After you have saluted, report in some such manner as this, "Sir, a message from Major Brown," and deliver the written message, or "Sir, Major Brown directs, etc."

Be accurate about all things. If necessary, ask the examining officer to repeat the message if you do not clearly understand it. When you repeat the message yourself, speak loudly and boldly enough for him to thoroughly understand you.

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